THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVIII. No. 702.] LONDON, OCTOBER 24, 1876. [28TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—12,000 cubic feet of gas per ton of coal: 28-candle gas; coke 66·70 per cent.; volatile matters 33·30 per cent. Coke of good quality.

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GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

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SPECIAL GASOMETER PAINT
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These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.

They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.

The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov* 2, 1866.

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Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.

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RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL OR ELSE NO MONEY TAKEN FOR THE CONTRACT.

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Retort-Setters sent to all parts of Europe and America
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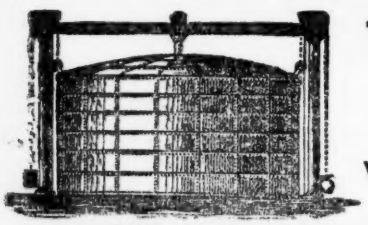

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ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

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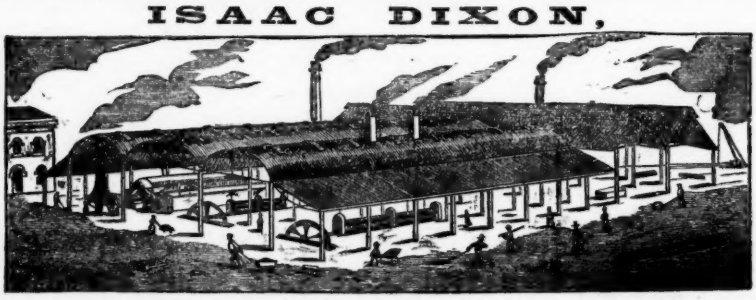

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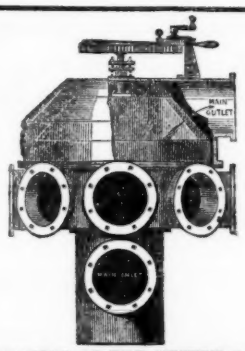
The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

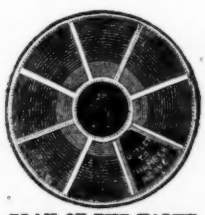
JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

C. & W. WALKERS'

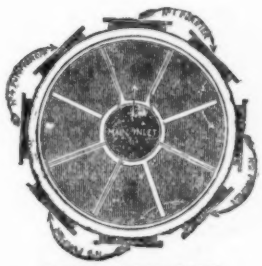
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one ont of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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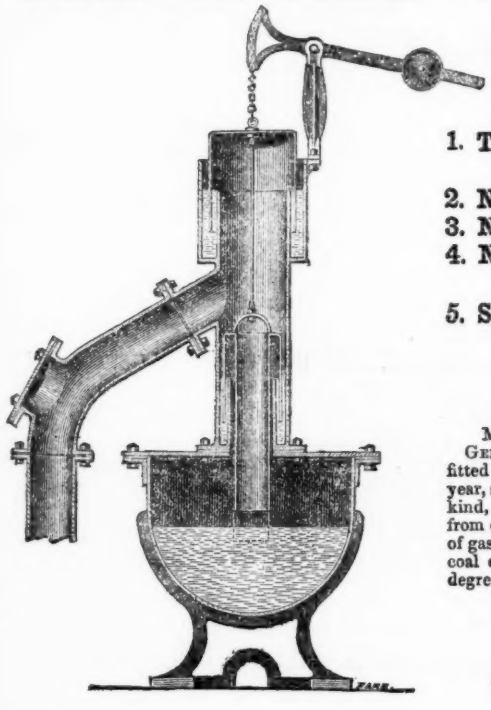
SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Tenby Gas-Works, March 29, 1876.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—In reply to your inquiry, I have to say that all the retorts at these works are fitted with your Self-Acting Patent Dip-Pipes. They have been in use now for more than a year, some for more than two years. They have never required repair or attention of any kind, and work admirably. By the use of these removable dips the retorts are kept quite free from carbon, the charges burn off more quickly than before they were adopted, and the yield of gas is increased. We get regularly a weekly and monthly average yield of gas per ton of coal exceeding 10,400 feet of 14-candle gas, and I attribute this excellent result in no small degree to the use of these Self-Acting Removable Dip-Pipes.

I am, gentlemen, yours faithfully,

(Signed) EDMUND H. STEVENSON.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

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OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

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Attention is called to their Dry Meters in Wood Cases, as used by the principal London Gas Companies. These Meters are especially suitable for seaport towns and for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

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INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

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IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS ENGINEER,

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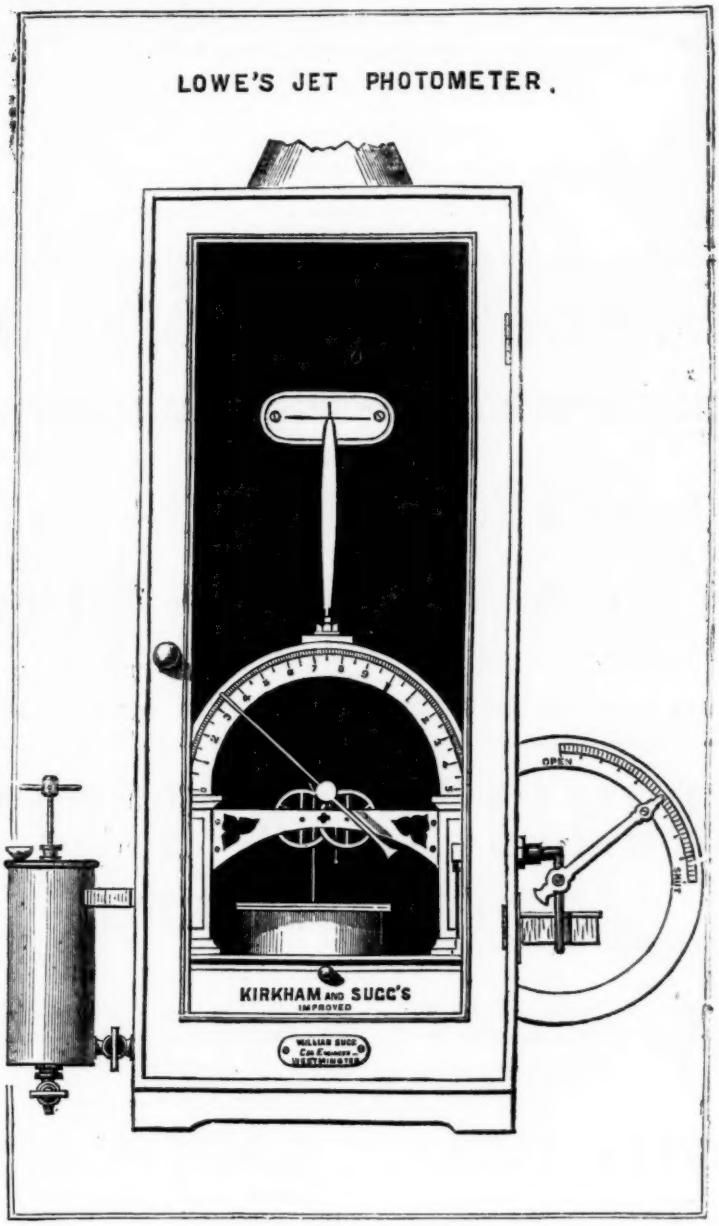
"EVANS"

Photometers,

which do not require a Dark Room, with every Fitting accurately made to Gauge, French Polished Bench and Drawers complete, as approved by the Gas Referees.



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Photometers,

with Fittings and Bench complete for Dark Room, as approved by the Gas Referees.

LOWE'S JET PHOTOMETER

(KIRKHAM AND SUGG'S IMPROVEMENTS),

With new external Water-Line Regulator; Improved Micrometer, with Quadrant divided into 45 degrees; Valve, with *pro ratâ* opening; Improved Ventilator, Purple Glass Height of Flame Measurer; King's Gauge, working on Friction Rollers. In French Polished Pine Case. Diagram for ditto for finding the Illuminating Power in Candles.

PRICE £12 10s. COMPLETE.

Can also be had with additional Scale on Pressure Gauge, to show by inspection the Illuminating Power in Sperm Candles, at a slight extra cost.

NOTE.—When an order is given for a Jet Photometer with this latter addition, it will be necessary to state about the quality of Gas for which it will be used. The range in candles will not be more than three or four.

PRICE LISTS WILL BE FORWARDED POST FREE ON APPLICATION.

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Manufactory: 19 & 20, NICHOLAS LANE, E.C.

SUN-BURNERS,

With Regulating Valves to obviate down draught.

MEDIÆVAL & OTHER GAS-FITTINGS

For Churches and Domestic Use.

ARCHITECTS' OWN DESIGNS WORKED OUT.

ESTIMATES FREE OF CHARGE.

THE TRADE SUPPLIED.

SOLE CONSIGNEES FOR BRÖNNER'S IMPROVEMENTS IN GAS LIGHTING.

IN THE MATTER OF

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HENRY GREENE AND SON, 155, Cannon Street, London, Sole Agents for Great Britain, Ireland, and Colonies, of Brönner's Improvements in Gas Lighting, beg to inform the public that on the 13th of January, 1876, Julius Brönner obtained an injunction in the Court of Session, Scotland, against Donald M'Vean, Gas-Fitter, 14, Newton Street, Glasgow, prohibiting him from in any way advertising or offering for sale as Brönner's Burners, any Burner not manufactured by Julius Brönner, or from in any way inducing the public to believe that the said Donald M'Vean sells or keeps for sale Brönner's Burners, manufactured by Julius Brönner, while such is not the case.

Also that on the 9th of November, 1875, he obtained injunction in the same Court, and in the same terms, against R. M. Brechin and Co., 46, North Hanover Street, Edinburgh.

Also that on the 20th of April, 1875, in a suit in Chancery, before Vice-Chancellor Malins, number 1874, B 365, he obtained injunction against another defendant, in the same terms and on similar grounds.

MESSRS. NEWTON, CHAMBERS, & CO.,

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MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

THOMAS ALLAN & SONS,

IRONFOUNDERS,

WORKS:

SPRINGBANK FOUNDRY & NORTH WOODSIDE FOUNDRY,

GLASGOW;

BONLEA FOUNDRY, STOCKTON-ON-TEES,

Manufacturers of

CAST-IRON GAS AND WATER PIPES.

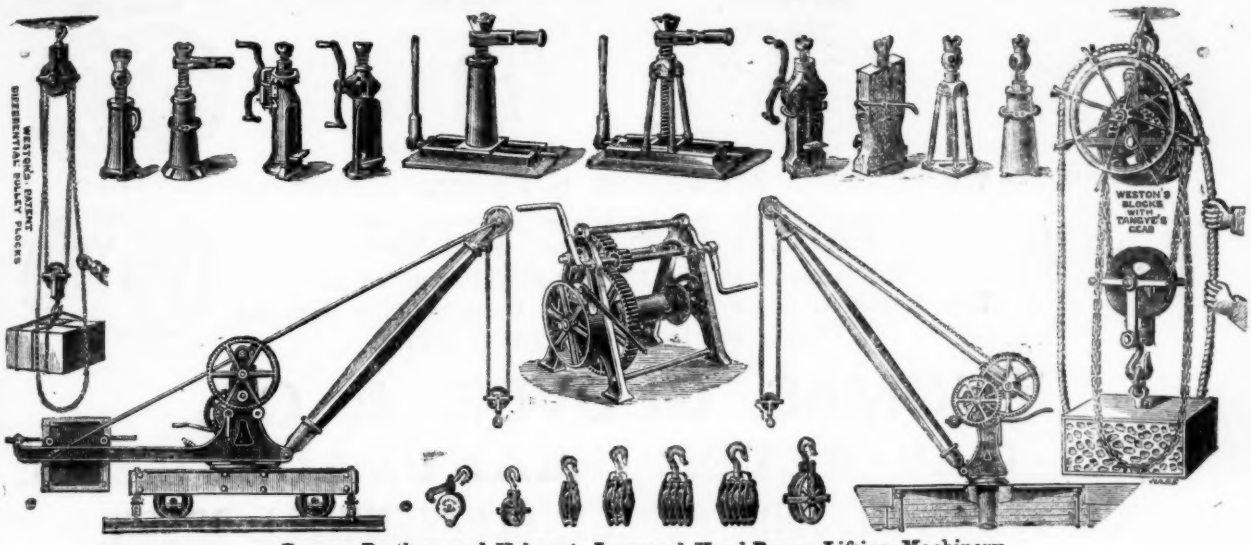
SIZES: ¾ to 12 inches at GLASGOW.

„ 1½ to 7 „ STOCKTON.

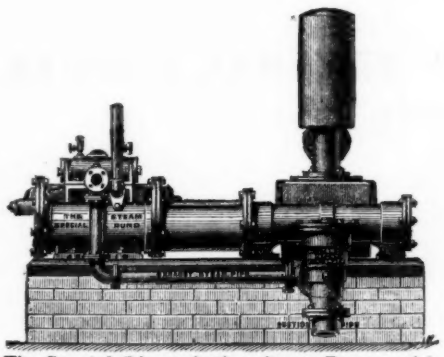
A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 12s. 6d. from Glasgow.

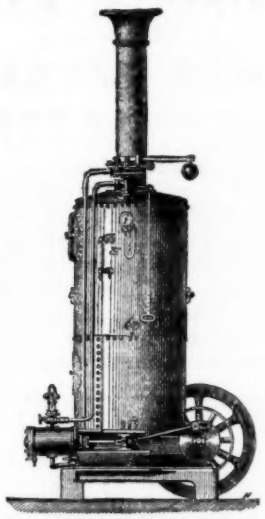
London Agent: Mr. A. C. FRASER, ST. STEPHEN'S CHAMBERS, TELEGRAPH STREET.



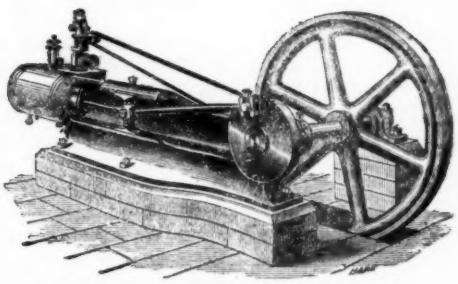
Tangye Brothers and Holman's Improved Hand-Power Lifting Machinery.



The Special Direct-Acting Steam-Pump, with Holman's Patent Exhaust Steam Condenser. Over 12,000 in use.

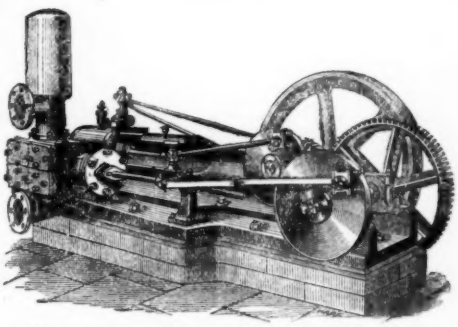


Horizontal Steam-Engine, With Vertical Boiler.

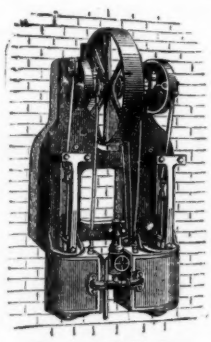


High Pressure Expansive Steam-Engine. Nearly 2000 sold since introduction in Dec., 1869.

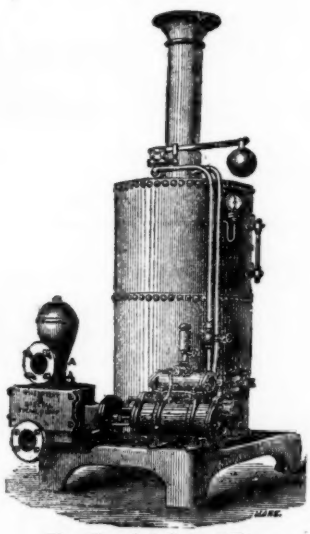
Willans' Patent Three-Cylinder Engine.



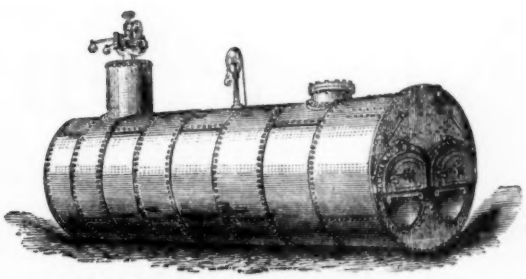
High Pressure Expansive Steam-Engine, combined with Double-Action Pump.



Double-Cylinder Wall Engine



The Special Steam-Pump, with Vertical Boiler.



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New York, 1853

Paris, 1855.

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Paris, 1867.

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METERS FOR MEASURING WATER.

CONTENTS.

Circular to Gas Companies:— PAGE

The "Sulphur" Question in the Metropolis . . . 589
Probable Legal Proceedings against the Referees . . . 589
Proposed Adjustment of the Parliamentary Expenses on the Metropolis Gas Bill 589
The Gas Accounts of the Manchester Corporation . . . 589
Gas Profits of the Birmingham Corporation . . . 590
Gas Profits of the Leeds Corporation . . . 590
Gas Agitation in Liverpool . . . 590
The Corporation of Wakefield and the Gas Supply . . . 590
The Hanley Town Council and the British Gas Company . . . 590
Inaugural Address of the President of the West of Scotland Association . . . 590

Water and Sanitary Notes:—

Mr. Hawksley's Inaugural Address at the Social Science Congress. . . . 590
The Profitable Disposal of Town Sewage . . . 590
Our Earth in Process of Desiccation . . . 590

Leading Articles:—

Manchester Corporation Gas-Works . . . 591
A Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas . . . 592

Correspondence:—

Recovery of Light Oil in the Distillation of Shales . . . 594
Simultaneous Photometer Clock and Meter Action . . . 594
South Metropolitan Gas Act, 1876. . . . 595

Parliamentary Intelligence:—

House of Commons Committee—Wakefield Water Bill . . . 595

Miscellaneous News:—

Directory of Manufacturers . . . 592
Accident at the Dublin Water-Works . . . 592
Metropolis Gas Supply . . . 597
Metropolis Water Supply . . . 598
East Brent Water Supply . . . 598
Meeting of The Gaslight and Coke Company . . . 598
Newcastle and Gateshead Water Company . . . 598
Manchester Corporation Gas-Works . . . 599
West of Scotland Association of Gas Managers. . . . 601
Meeting of the Sheffield United Gas Company . . . 603
National Association for the Promotion of Social Science . . . 604
Trade Reports . . . 605
East London Water-Works Company . . . 606
Glasgow Water Supply . . . 606
Drainage of Kingston—Proceedings against the Corporation . . . 606

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 24, 1876.

Circular to Gas Companies.

THE "Sulphur Question" in the Metropolis is assuming a new and interesting phase. It will be remembered that the maximum of "sulphur" impurity, allowed by the "Instructions" of the Referees, for the winter half, in gas made at the Haggerston works of the Chartered Company, is twenty-five grains in the hundred cubic feet. Dr. Williamson's report, an abstract of which we published last week, showed that the maximum of "sulphur" found in the gas made at that station (tested at Graham Road, Dalston), during the last quarter (summer make) was under eighteen grains per hundred cubic feet, and that the average of the quarter was only fourteen and two-tenths of a grain. During that quarter, so far as we know, but few complaints of a nuisance, produced at the works, were made. Recently, however, it seems that, with a view to providing for the winter make, more extensive plant for lime purification has been brought into operation, with results which appear to us to have a serious aspect. It is alleged that an intolerable nuisance has, for the last few weeks, been experienced in the neighbourhood of the works, owing to the escape of sulphuretted hydrogen when the lime purifiers are opened for renewal. There are some odd features in the case, but we shall not remark on them.

We need only call attention to the fact that a great effort is about to be made to get rid of lime purification in the urban gas-works. The Vestry of Shoreditch talk of appealing immediately to the High Court of Chancery for an injunction, prohibiting the use of the process which occasions the nuisance, and then of taking proceedings against the Referees for fixing a limit of "sulphur" impurity which can only be attained by means certain to cause a nuisance. The Metropolitan Board have been invited to join in the proceedings, and will probably do so; for we believe a majority of the Board do not regard "sulphur" in gas as objectionable.

The reasons for taking proceedings against the Referees, are to be found in the thirtieth section of the Chartered Company's Act of this year, which is as follows:—"The Gas Referees shall, "from time to time, ascertain with what degree of purity the "company can reasonably be required to make and supply gas "continuously, without occasioning a nuisance to the neighbour-"hood in which the works are situate, and shall thereupon pre-"scribe and certify the maximum amount of impurity" to be allowed, &c., &c. Now, we are bound to suppose that the Referees have taken the special circumstances of the Haggerston station into consideration, and when they are placed on their defence, we shall learn their opinion as to the possibility of carrying on lime purification without offence.

We may say at once, we are pleased this case has arisen. Our readers know well our views on the "sulphur" question, which need not here be repeated. With the opinions we hold, however, we shall be heartily glad if the public will agree to, or insist on the abolition of, the lime process. It has, hitherto, rested with the public; but now, it seems, it will rest with the judges, to say whether it shall, or shall not, be continued. It is dispensed with in most large towns and cities in the north, where, as at Liverpool, we rather think, no lime at all is used, not even to remove carbonic acid, the loss of illuminating power, consequent on the presence of this body, being made up by the use of an extra quantity of cannel. So far as we know, people in the north do not complain of "sulphur." The London authorities have, hitherto, been more fastidious; and it is a noticeable fact, that it was not until they proposed to supply gas themselves, that they discovered "sulphur" was of no consequence.

It would appear from the report of Dr. Sutton, which we publish in another column, that the amount of "sulphur" impurity present in gas, when simply purified with oxide, is only from thirty to forty grains. It will, of course, depend on the coal employed; but, we believe, it will turn out to be considerably more. As to this, however, it will be of interest presently to see the results of the testings of the Commercial Company's gas, in whose case the amount of "sulphur" found is simply to be recorded. The experiments of Mr. Lewis Thompson, who found very large quantities, were, we rather think, made when lime alone was employed in the work of purification, and before the proper mode of using it for the removal of bisulphide of carbon had been discovered. Any information on the matter will be extremely valuable. If it is a fact, that only thirty grains of "sulphur" are to be found in oxide purified gas, and that all the expense, annoyance, and nuisance of lime purification is incurred to remove five grains, then, by all means, let lime purification be given up, not only at Haggerston, for the benefit of the inhabitants of Shoreditch and Hackney, but at Beckton and Bromley, and everywhere else, for the sake of the gas companies. We shall watch the proceedings about to be taken with intense interest, and, apart from scientific considerations, we will not conceal a hope that in this case the local authorities may triumph. Mr. Vernon Harcourt, on whom the *onus* of supporting the Instructions of the Referees will mainly rest, has a difficult task before him. He is, however, no doubt, fully prepared for it, and most interesting discussions are certain to result. We forgot to mention above, that the powers of the Board of Trade are also to be invoked. What course they may take, under the circumstances, it is impossible to guess. We remember that some years ago they were constantly pressed by the Corporation of London, and the Metropolitan Board, to compel the former Referees to fix a "sulphur" maximum, and that a low one. But the times have changed. To-day they are to be asked to order the Referees to leave the matter alone.

It is hardly worth notice, but we may just mention, that the Metropolitan Board are about to ask the Corporation of the City to square accounts with them, with respect to the cost of the parliamentary proceedings on the gas question last year. We may, therefore, presently learn what these costs amounted to, and we rather think the public will be astonished at the sum. While on this, we may mention, that the return ordered by the House of Commons of the sums expended by the Metropolitan Board in promoting or opposing Bills during the five years preceding 1875, has been deposited, but we shall not be able to obtain a copy until it is ordered to be printed early next session.

We publish to-day the gas accounts of the Corporation of Manchester in their usual voluminous form. A cursory examination of them removes any feeling of astonishment, that all the Corporations in the kingdom look to Manchester with envy. The income derived by the Corporation from the sale of gas and residuals during the year ending June 30, 1876, amounted to £393,021, and their expenditure on revenue account during the same period appears to have been £291,789, showing a gross profit of £101,232. The net or surplus profit of the year, after the payment of interest due, and sums in liquidation of mortgage debt, is £56,976, of which sum £39,410 is paid over to the Improvement Commissioners for current purposes, and £17,565 is retained towards the repayment of advances made to the Commissioners in anticipation of profits. It will be seen, that the charge on profits for anticipation is now cleared off within £9000, so that in the current year it is certain to be extinguished, notwithstanding the reduction in the price of gas. These accounts fully support the opinion we expressed some weeks ago, that if the undertaking were managed on the principles we advocate, the price of gas in Manchester might be, at least, one-third less than it is now.

It is very satisfactory to see, that the consumption goes on increasing in Manchester, and it would, no doubt, increase much faster, if the price were lower. The tax of £56,000 is rather

heavy on the consumers. We should be glad to have a comparative statement of the rates in Manchester and Sheffield, for example, in which latter place the gas and water supply are in the hands of companies. We are inclined to think, that the rates in Manchester are quite equal to those in Sheffield, notwithstanding the large gas profits. It must, however, be admitted, that much has been done in Manchester, which, without gas profits, would have required a high Improvement-rate. This will be seen when we mention, that the amount of profit paid over to the Commissioners, from 1862 to 1876 (inclusive), amounts to close upon £400,000.

The probable advantages of supplying gas as cheaply as possible, socially, at all events, will be seen by a glance at Appendix C, which shows that a considerable majority of the consumers use only two and three light meters. It is among this class that it is highly desirable to promote consumption. And this leads us to correct a blunder we made some weeks ago, when speaking of the deposits held by the Gas Committee. It was represented that four-fifths of the consumers were depositors, whereas it should have been said that four-fifths of the depositors were required to deposit only five shillings. The interest on this sum, at 3½ per cent., is only twopence per annum; but the Corporation have determined to keep books, and pay it. As a matter of fact, the Corporation have deposits amounting to only £16,279 in hand, and we notice in the accounts, "bad debts" to the amount of £839, which shows that deposits may be justifiably exacted in Manchester.

The gas undertaking of the Corporation of Birmingham is by no means so profitless as the absence of detailed accounts induced us to believe. Since our remarks on this subject, the secretary of the Gas Committee has courteously informed us that £25,000 have already been paid to the Borough Treasurer out of the profits of the current year.

The Corporation of Leeds have also done well with their gas undertaking during the year ending June 30, they having made a gross profit of £36,000. After having spent £5000 on renewals, and applying £9000 to the sinking-fund, there remains £22,000 as net profit, to be applied we do not yet know how. We shall probably have full details of the accounts next week.

Dr. Cross delivered his long-promised speech on the gas question at Liverpool, on Thursday evening last, to a meeting which, according to the reporter of the *Liverpool Daily Post*, was "fairly" attended. The chairman, in opening the proceedings, lamented the absence of "great people" from the platform, but expressed himself confident of the success of the movement without their assistance. There appears to us to be very little real enthusiasm on the question, and Dr. Cross's speech almost induces us to believe that his views are somewhat modified. He once again blamed the company for paying the cost of the landing-stage out of current profits. He did not contend that it was not a legitimate expenditure, but complained that the company did not exhibit self-denial by reducing the price of gas and submitting to diminished dividends. Such conduct would have been generous, but it could hardly have been expected of human nature. Dr. Cross's scheme for mending gas matters in Liverpool appears to be the formation of a competing co-operative company, which he believes might be established with a capital of £800,000. He thinks the Corporation might be persuaded to give such company the power to break up the streets, but he forgets to mention that, such permission being obtained, there is nothing to prevent any one from indicting the company for committing a nuisance the moment they struck a pickaxe in a roadway. Much more reasonable is his suggestion that, if the United Company were bought up for two millions, the town would have a bargain. We shall not attempt to appraise the value of the Liverpool undertaking, but we may say, that purchase or leaving matters alone is the only course open. It seems that the committee have, by a house-to-house canvass, succeeded in collecting £400 for their expenses, some of it having been contributed in coppers by very poor people. We sincerely hope these may derive some benefit from their subscriptions, but we have great doubts on the matter.

The Wakefield Town Council, after a discussion of a somewhat remarkable character, have resolved to promote an Improvement Bill, to empower them, among other things, to purchase the undertaking of the Wakefield Water Company. It was also proposed to take powers for a compulsory purchase of the undertaking of the Gas Company, but after discussion the Council resolved to expunge all the clauses relating to that part of the question. The Gas Company will themselves, in all probability, go to Parliament next session, and we may expect that a severe contest between them and the Corporation will ensue

A deputation from the Hanley Town Council have had an interview with the directors of the British Gas Company, with reference to the proposed purchase of the undertaking of the company in the district of Hanley. They were told that the directors would be very unwilling sellers, but that if an offer were made it would be considered. At a meeting of the council last week, the deputation reported the result of the interview, and, after a short discussion, it was unanimously resolved to offer the company perpetual annuities equal to maximum dividends. There seems to be a desire on the part of the Town Council of Hanley to acquire the Tunstall undertaking as well.

We commence to-day the publication of the interesting inaugural address of Mr. Monk, the President of the West of Scotland Association of Gas Managers. There is only one point we can refer to now, and that is, the suggestion that the British Association for the Advancement of Science should have a Special Gas Section at their meetings. If the suggestion involves the breaking up of the existing Associations of Gas Managers, we should, at once, raise a strong objection. It would be difficult for gas managers to follow the British Association in their annual migrations between Aberdeen and Plymouth, and Norwich and Belfast; but, if they could, we admit that some advantage might be derived from the opportunity of intercourse with the eminent engineers and chemists who attend the meetings of the British Association. At such meetings broad principles might be discussed, but success in gas manufacture can only be obtained by attention to details, with which only practical managers are fully acquainted. For this reason, and for many others, we hope that the existing Associations of Managers will continue in undiminished vitality.

Water and Sanitary Notes.

We begin, to-day, the publication of the very interesting Address, delivered by Mr. T. Hawksley, C.E., as President of the Health Section of the Social Science Association. There is always something strikingly original in Mr. Hawksley's addresses, and the readers of this will be struck with astonishment at the results of his calculations as to the *possible* increase in the population of England. Their suggestiveness is overwhelming. It is impossible to follow out the various trains of thought which thrust themselves on our minds as we contemplate these calculations. All our efforts are now directed to the preservation of human life, and if we continue as successful as at present, the Anglo-Saxon race will increase and multiply so as, in the course of three or four hundred years, to require for their habitation fifteen such worlds as ours!

The causes of the depopulation of countries have been very imperfectly studied. Who knows, for instance, what became of the vast populations which once inhabited Asia Minor and the northern part of Africa? That starvation played the leading part in the tragedy, is only too probable; and it would seem that a similar fate is reserved for England. We pray to be delivered from "plague, pestilence, and famine." Well, if we are, the consequences are to be seen in Mr. Hawksley's calculations. We already import forty per cent. of our food; in a few generations we shall be compelled to import the whole of it. Our coal and iron may last a few generations longer, and what then? To discuss this question, is not the business of a journal like ours; but we may here express a wish, that Professor Jevons, Mr. G. H. Lewes, and Mr. Herbert Spencer would study this momentous question, and, from the experience of the past, draw us lessons for our guidance in the future. We publish but a portion of Mr. Hawksley's Address to-day, and may, next week, refer more particularly to his remarks as to the results of our efforts in the direction of sanitary improvement on the duration of life in England. He shows that the mean duration of life in England at the present day is exactly what it was in 1838, before what are termed sanitary works had been thought of; but he acknowledges, as every one must, that these works have been beneficial to what we may call the "fittest survivors."

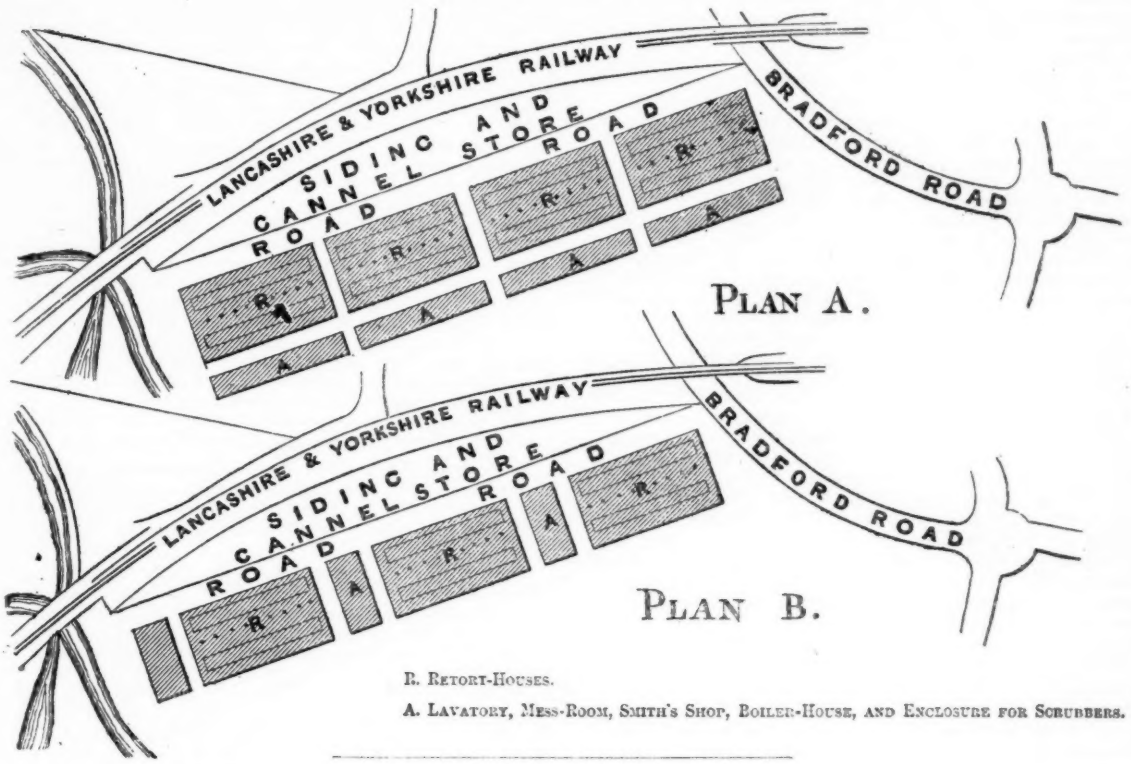
The profitable disposal of town sewage is still a problem which seriously occupies the attention of local authorities. For their comfort, we may mention that "Old Moore," whose Almanac has just been published, prophesies that next June a great chemical discovery will be made, which will go far towards solving the problem of the profitable disposal of sewage. We commend this prophecy to the notice of the authorities of Kingston, Surbiton, and other places up the river, who, when next pressed by the Thames Conservancy Board, may plead for delay until "Old "Moore's" predicted process is made public, or the Local Government Board and Colonel Cox interfere with an united scheme.

When alluding to the causes of depopulation in connexion with Mr. Hawksley's paper, we omitted to mention one which has been conjectured by many philosophers, and which has recently been put forward very strongly by Professor T. S. Whitney; it is a theory of starvation owing to the sterility of the soil, consequent on the absence of rainfall. To this, following the destruction of the forests, he and others ascribe the depopulation of the northern shores of Africa. His hypothesis is, that the earth is undergoing

a gradual process of desiccation, the ultimate result of which may be readily guessed. According to him, we are slowly being reduced to the condition of the side of the moon we can see, on which we do not believe a man exists. The other side may be a swamp, for all we know. As regards our own earth, we do not see where the water is to go to, if it leave our atmosphere. The process of drying up must, however, last over millions of years. Our present supply of water will suffice for our time; so we may "eat, drink, and be merry," notwithstanding Professor Whitney's dismal prediction for—teetotallers.

MANCHESTER NEW GAS-WORKS.

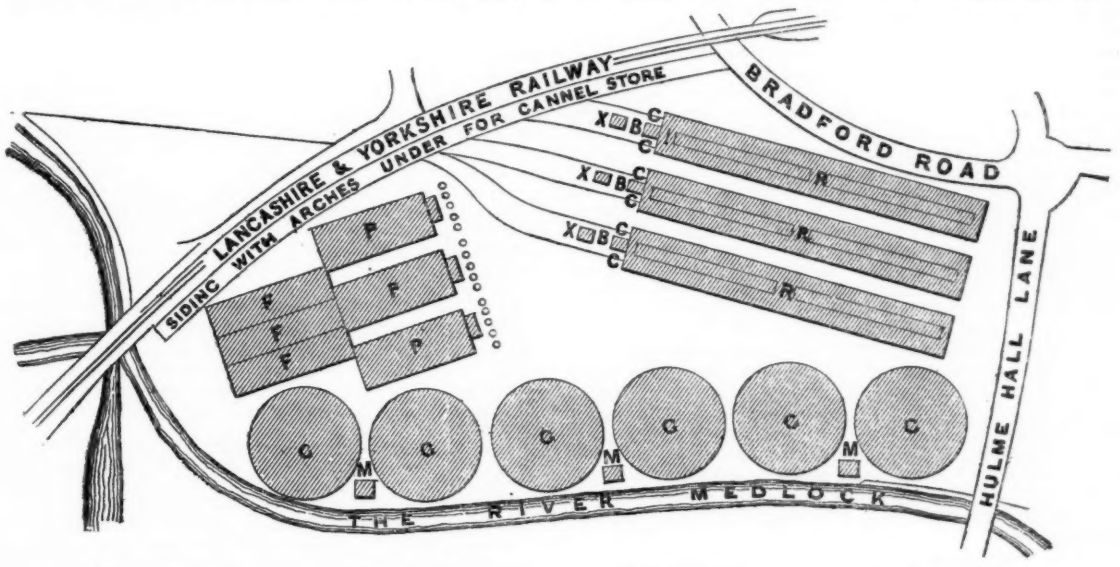
DESIGN BY MR. G. W. STEVENSON, OF WESTMINSTER, AND MR. H. J. PAULL, OF MANCHESTER, TO WHICH WAS AWARDED THE SECOND PREMIUM OF £300.*



R. Retort-Houses.

A. Lavatory, Mess-Room, Smith's Shop, Boiler-House, and Enclosure for Scrubbers.

DESIGN BY MESSRS. NEWTON, CHAMBERS, & CO., OF SHEFFIELD, TO WHICH WAS AWARDED THE THIRD PREMIUM OF £200.*



B. Boiler-Houses. C. Condensers. X. Exhausters. R. Retort-Houses.
P. Purifiers. F. Revivifying Floors. G. Gasholders. M. Meter-Houses.

* The general description of these Plans was given in the Journal for Sept. 26, pp. 449, 450.

The two remaining plans to be described are the following:—

"*Monogram.*"—(Hodgson Jones, Westminster.)

This design consists of four retort-houses arranged in pairs, each pair being parallel to a chord line of the siding, with a wide space between them, opposite the road in the centre under the railway. Rails are provided for supplying the cannel direct, and also for removing the coke. Three purifying-houses adjoin one pair of retort-houses, and one adjoins the other. The details given in the general description differ from many furnished by the other competitors. There are in each retort-house 48 ovens, each set with seven retorts, giving 672 mouthpieces. It is assumed these will be worked eight charges in 24 hours, at 2¼ cwt., or will carbonize 18 cwt., giving a total for each section of 604 tons of cannel carbonized, which, at 9500 feet per ton, will give a total make of 5,738,000. Taper ascension-pipes are proposed, 6 inches in diameter at the bottom, and 4 inches at the top. Each length of hydraulic main is to take four beds, and the gas and tar are to flow together to wrought-iron depositing-chambers 4 feet in diameter, running round the retort-houses. Four condensers are proposed, four Körting's exhausters, and eight Cleland's scrubbers, formed with 12-inch pipes. The purifying-houses are to be in three stages, the ground floor for lime and oxide, the first floor for revivifying, and the upper floor for the purifiers, six in each case being for oxide and two for lime. Steam-boiler, engine, and pumps are provided for working the lifts in the purifying-

houses. The description enters very fully into details. Eight gas-holders are proposed, 180 feet in diameter, with two lifts of 38 feet. The total cost of the four sections is given at £616,000.

"*Clarior e Tenebris.*"—(Thomas Newbigging, Manchester.)

This design is proposed to be built in three divisions, capable of separate erection, each producing 5,400,000 cubic feet of gas per day. It has six retort-houses, in three continuous lengths, two houses in each, parallel with each other, placed as nearly parallel with the railway as the site will allow, so as to obtain greater facility for the carriage of material to and from the works, on curved branch lines, supported by girders and pillars, without the use of turntables. Each retort-house is 342 feet 6 inches long by 64 feet wide, and contains thirty ovens, 8 feet wide, in which are placed nine through retorts, representing, at 5000 cubic feet per mouthpiece, a production of 2,700,000 cubic feet of gas per day for each house, or a total production for the six houses of 16,200,000 cubic feet, with a consumption of 1700 tons of coal.

A chimney is provided for each group of ten ovens, with a distinct foundation, separate from the retort-benches. Foulis's stoking machinery was intended to be employed in charging and drawing the retorts, worked by hydraulic pressure, the pumping machinery for which would be contained in a separate building, 125 feet by 58 feet, having the requisite boilers, engines, and accumulators. It is proposed that the coke as drawn and slaked be removed in light iron trucks, and be hoisted by means of a small steam jib-crane from the floor to a platform, erected on brackets secured to the walls. This platform to carry a line of rails, and the trucks to be moved thereon by an endless wire-rope, actuated by a small stationary engine, to the coke ground outside. The floor of the house is thus unobstructed by coke traffic, whilst the saving in manual labour, it is stated, will more than compensate for the outlay in providing the required mechanical appliance. The coke tramway is to be erected 33 feet from the floor, or 7 feet above the level of the railway, so as to allow of the coke trucks discharging their contents into the railway waggons *in situ*. A tramway is to branch off on an incline to a tipping stage in the coke yard, against which carts may be backed and loaded. Cannel and coal stores are provided on each side of each house, having a total aggregate of about 50,000 tons, equal to 30 days maximum consumption.

The entrance to the coke yard is arranged with a view to preventing any excessive traffic in front of the park and cemetery gates.

Baths, lavatories, &c., for the use of the workmen are placed between each two retort-houses.

The condensers are at the west end of the retort-houses, and consist of 24 lines of pipes, 44 feet long and 18 inches in diameter, placed horizontally.

The tar-well is placed in close proximity to the condensers, under a portion of the coke ground, and is capable of storing 1,700,000 gallons of tar and liquor, equivalent to 40 days maximum production. The pump-room contains the necessary lift and force pumps for the tar and ammoniacal liquor.

Three exhauster-houses are provided, 50 feet by 20 feet, each having three exhausters, with a boiler-house attached, 42 feet by 32 feet 6 inches. Mann and Walker's scrubbers are proposed, 15 feet in diameter and 60 feet high, three to each two retort-houses.

The purifying-house is in three distinct divisions, the whole forming one large shed, 425 feet long by 264 feet wide. The purifiers are 32 feet square, 5 feet deep, supported by girders on columns. Each separate division to have three sets, eight in each set. The first four vessels in each set to be charged with lime, intended for the elimination of the carbonic acid impurity; the next two also charged with lime, which on becoming a sulphide by the action of the passing gas, arrests the bisulphide of carbon; the remaining two are charged with oxide of iron to remove the sulphuretted hydrogen. The space beneath the purifiers is for revivifying the oxide, and manipulating the lime. Travellers are provided over the purifiers for moving the material as hoisted. Six station-meters are provided in one house, 144 feet by 38 feet. Six gasholders, with two lifts, are proposed, each capable of storing 2½ million cubic feet; the tanks being 186 feet in diameter and 48 feet deep. The governor-house is 54 feet by 26 feet. The whole works when complete are estimated to cost £760,000.

In these descriptions we have endeavoured to take the salient points of each design, giving wherever necessary the precise words of the author. Certain essential portions which follow as matters of course we have omitted to notice, such as offices near the gates, stores, shops, and the like. Our object has been to give as clearly as possible the schemes for gas-making, with the points bearing upon the process proposed.

DIRECTORY OF MANUFACTURERS.—Messrs. Hodder and Stoughton, of Paternoster Row, London, have just issued the fifth edition of their "Illustrated Guide, Directory of Manufacturers, and Register of Trade Marks of Great Britain and Ireland." It is intended for the use of home, colonial, and foreign buyers, merchants, shippers, and other purchasers of British manufactured goods, and is printed in three languages—English, French, and German. We cannot look upon it as a perfect directory of its class, but no doubt it will prove highly serviceable for the purposes designed by its industrious compilers.

ACCIDENT AT THE DUBLIN WATER-WORKS.—The burst of the Vartry pipe has been successfully repaired, and the water is flowing into Stillorgan reservoir at the rate of 15 million gallons daily. It will still, however, be some days before the citizens can enjoy the luxury of a full supply of high-pressure water, for it will be prudent and necessary to fill the nearly exhausted reservoir at Stillorgan first. We do not think that even the most captious attribute blame to any person for the recent accident, but it certainly has rudely shaken the confidence of the citizens; and we trust that precautions will be taken to guard, as far as possible, against the possibility of its recurrence.—*Freeman's Journal.*

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CXIV.

GAS TESTING.

Having considered the principles of ordinary photometry, and likewise the comparative value of the different light standards which have been from time to time proposed, it now remains more especially to consider the practical applications of photometry with respect to testing the illuminating power of gas. It will also be convenient, at the same time, to describe the modes of testing gas for various impurities recognized as objectionable in the different Acts which control our present gas supply. The mode of testing gas for illuminating power and purity are well described by the Instructions issued by the London Gas Referees for the guidance of the gas examiners; but, previous to noticing the actual methods employed, we shall shortly describe the manner in which the rooms devoted to the testing are fitted up. The London gas station consists, as a rule, of three rooms, one of which is devoted to the photometrical portion of the work; one to the more essentially chemical part, in which the analytical operations are conducted; and one devoted entirely to the apparatus for the estimation of the sulphur compounds other than sulphuretted hydrogen. The necessity of a separate room entirely devoted to the sulphur apparatus is, to say the least, questionable, the only object being the possible exclusion of any error which might arise from the contamination of the atmosphere with the products of combustion arising from the various burners in use about the gas station. Some time back, Dr. Letheby tried experiments in order to ascertain to what extent the accuracy of a sulphur test was vitiated by being conducted in an atmosphere in which gas containing sulphur compounds was burning, and which, therefore, would contain traces of sulphurous and sulphuric acids; but he found that the error so produced was infinitesimal.

Alcohol was burned under the conditions mentioned, and the products of combustion collected, the experiment extending over a considerable period, with gas-burners alight in the room during the whole time; but, as an eventual result, only a trace of sulphur acids was found.

Referring again to the gas station, the photometer-room is fitted with an ordinary 100-inch Evans's closed photometer placed over a bench, on which is arranged the accessory apparatus necessary for the testing. This consists of a test-meter to register the consumption of gas, a screw-tap to regulate the quantity, and a balance governor to equalize the pressure. A King's gauge connected to "inlet of meter," "outlet of meter," "outlet of governor," and "point of ignition," enables the pressure to be observed at any of the points named, and there is likewise a sulphuretted hydrogen test apparatus, through which the gas passes continuously during testing. A three-way tap connects the gas-main with the apparatus, and at the same time allows the gas supply to be shut off, and communication opened with the "cubic foot test" when required. For weighing the candles it was formerly customary to employ an ordinary balance placed on the photometer-table, but most of the gas-testing stations are now fitted with a modified form of candle-balance contrived by Mr. Keates, and which is used *in situ* in the photometer. The sulphur-room is generally, in reality, a portion of the photometer-room isolated by a glass framing; it contains the Referees sulphur and ammonia tests, and the "ten-feet stop-meter," which limits the quantity of gas consumed. The remaining room—viz., that devoted to the more essentially analytical operations—is fitted with a table, on which is arranged the necessary apparatus—a chemical balance, Bunsen burners, measure glasses, burettes, &c., to effect the estimation of the sulphur and ammonia. The actual details of the operations, both in analysis and photometry, will be best understood from the Referees Instructions, which we here give:—

AS TO THE TIMES AND MODE OF TESTING FOR ILLUMINATING POWER.

The testings for illuminating power shall be three in number daily.

The photometers to be used in the testing-stations shall be the improved form of the Bunsen photometer, which have been certified by the Referees.

The disc in the photometer shall be changed at least once a week.

The chimneys must be cleaned daily, at the commencement of each set of observations.

The candles shall be such as are described in sec. 25 of the Metropolis Gas Act of 1860—namely, sperm candles of six to the pound, each burning 120 grains an hour.

Two of these candles shall be used together.

The quantity of gas burnt in each burner shall be 5 cubic feet per hour.

The gas in the photometer is to be lighted at least fifteen minutes before the testings begin. The gas shall be kept continuously burning from the beginning to the end of the testings.

Each testing shall include ten observations of the photometer, made at intervals of one minute.

The consumption of the gas is to be carefully adjusted to 5 feet per hour, which is shown by the long hand of the meter and the seconds hand of the clock travelling together continuously for some minutes.

The candles are to be lighted at least ten minutes before beginning each testing, so as to arrive at their normal rate of burning, which is shown when the wick is slightly bent and the tip glowing. The standard rate of consumption for the candles is 120 grains each per hour. Before and after making each set of ten observations of the photometer, the gas examiner shall weigh the candles; and if the rate of consumption shall have been more or less per candle than 120 grains per hour, he shall make (and record in a book to be kept for the purpose) the calculations requisite to neutralize the effects of this difference.

The gas examiner shall, at least once a week, test the meter-clocks by the standard clock in each testing-station.

The gas examiner shall observe and record the temperature of the gas, as shown by the thermometers attached to the meters, and also the height of the barometer. The volumes of the gas operated upon during the testings may be corrected by these data in the following manner (the standard of comparison being, for the barometer, 30 inches; and for the thermometer, 60°):—Suppose the thermometer stands at 56°, and the barometer at 30·5 inches, multiply the quantity of gas consumed by the *tabular number* corresponding to the indications of the barometer and thermometer (as given in the Table, Appendix B),—the product will be the corrected volume of the gas—*i.e.*, the volume the gas would have occupied at the standard temperature and pressure. Thus:—

Volume of gas consumed . . . . . 5 cubic feet
Tabular number for barometer and thermometer . 1·025
Then $1·025 \times 5 = 5·125$, the corrected volume.

The same object may be attained more shortly (*vide infra*) by simply dividing the illuminating power by the tabular number, or in the manner to be presently described in connexion with the testings for impurities.

The average of each set of ten observations is to be taken as representing the illuminating power for that testing. And the average of the three testings is to be taken as representing the illuminating power of the gas for the day.

The gas examiner shall record his observations and calculations for illuminating power in the form prescribed in Appendix A.

The calculations for working out the corrections, &c., for the illuminating power of the gas proceed in the following manner:—Add the observations together, and divide the sum by 10, to get the average; then, as two candles are used, multiply by 2, to get the illuminating power of the gas if tried against one candle. Then, as the standard rate of consumption of the candles (viz., 120 grains) is to the average number of grains consumed by each per hour, so is the above-obtained number to the actual illuminating power. Finally, make the correction for temperature and pressure, by dividing the illuminating power by the tabular number. For example (taking the tabular number as 1·025):—

Observations.

1st minute	7·6	Consumption of the
2nd ,,	7·4	two candles in
3rd ,,	7·3	10 minutes,
4th ,,	7·5	= 41 grains.
5th ,,	7·8	3
6th ,,	7·4	
7th ,,	7·4	123 = consumption of one
8th ,,	7·5	candle per hour.
9th ,,	7·5	
10th ,,	7·4	

10)74·8

Average, by two candles. = 7·48
2

Average, by one candle . = 14·96
Consumption by one candle per hour. = 123 grains.

4488
2992
1496

Standard consumption . . . . 120)1840·08

Correction for temp. and pres. . . 1·025)15·334(14·9 = corrected illum. power in candles.
1025

5084
4100

9840

The foregoing calculation can be shortened as follows, which is the form prescribed in Appendix A:—

Observations.

1st minute	7·6
2nd ,,	7·4
3rd ,,	7·3
4th ,,	7·5
5th ,,	7·8
6th ,,	7·4
7th ,,	7·4
8th ,,	7·5
9th ,,	7·5
10th ,,	7·4

Average, by two candles. = 7·48
Consumption by two candles in 10 min. = 41 grains.

748
2992

20)306·68

Tabular number . 1·025)15·334(14·9 = corrected illum. power in candles.
1025

5984
4100

9840

Appendix A.

Testings for Illuminating Power.

Barometer ..... Thermometer ..... Date ..... 187.....
Tabular Number .....

Hour.	..... P.M.	..... P.M.	..... P.M.	..... P.M.
	Consumption of sperm by two candles in ten minutes	Consumption of sperm by two candles in ten minutes	Consumption of sperm by two candles in ten minutes	Consumption of sperm by two candles in ten minutes . . ..
	Observations.	*Observations.*	*Observations.*	*Observations.*
Observations taken at intervals of one minute.	1st minute ..... 2nd ,, ... 3rd ,, ... 4th ,, ... 5th ,, ... 6th ,, ... 7th ,, ... 8th ,, ... 9th ,, ... 10th ,, ...

APPENDIX B.

Table to Facilitate the Correction of the Volume of Gas at Different Temperatures and under Different Atmospheric Pressures.

BAR.	THERMOMETER.																					
	40°	42°	44°	46°	48°	50°	52°	54°	56°	58°	60°	62°	64°	66°	68°	70°	72°	74°	76°	78°	80°	82°
28·0	·971	·967	·963	·960	·956	·952	·948	·944	·941	·937	·933	·930	·926	·922	·919	·915	·911	·907	·904	·900	·897	·893
28·1	·974	·970	·967	·963	·959	·955	·952	·948	·945	·941	·937	·933	·929	·926	·922	·919	·914	·911	·907	·904	·900	·896
28·2	·978	·973	·970	·968	·963	·959	·955	·951	·947	·944	·940	·936	·933	·929	·925	·922	·917	·914	·911	·907	·903	·899
28·3	·982	·977	·974	·970	·966	·963	·958	·955	·951	·947	·943	·940	·936	·932	·929	·925	·921	·917	·914	·911	·906	·902
28·4	·985	·980	·978	·973	·970	·966	·962	·958	·954	·951	·947	·943	·939	·936	·932	·928	·924	·920	·917	·914	·910	·905
28·5	·988	·984	·980	·978	·973	·970	·965	·961	·958	·954	·950	·946	·943	·939	·935	·932	·927	·923	·920	·917	·913	·909
28·6	·992	·987	·984	·980	·976	·973	·969	·965	·961	·957	·953	·950	·946	·942	·939	·935	·931	·927	·923	·919	·916	·912
28·7	·995	·991	·987	·983	·980	·976	·972	·968	·964	·961	·957	·953	·949	·945	·942	·938	·934	·930	·926	·922	·919	·915
28·8	·998	·995	·991	·987	·983	·980	·976	·971	·968	·964	·960	·956	·952	·949	·945	·941	·937	·934	·929	·925	·922	·918
28·9	1·002	·998	·994	·991	·987	·983	·979	·975	·971	·968	·963	·960	·956	·952	·948	·944	·940	·937	·933	·928	·925	·921
29·0	1·006	1·001	·998	·994	·990	·986	·982	·978	·974	·971	·967	·963	·959	·955	·952	·948	·943	·940	·936	·932	·928	·925
29·1	1·009	1·004	1·001	·998	·993	·989	·985	·982	·978	·974	·970	·966	·962	·959	·955	·951	·947	·943	·939	·935	·932	·928
29·2	1·012	1·008	1·004	1·001	·997	·993	·989	·985	·981	·977	·973	·969	·966	·962	·958	·954	·950	·947	·942	·938	·935	·932
29·3	1·016	1·011	1·007	1·004	1·000	·996	·992	·988	·984	·981	·977	·973	·969	·965	·961	·957	·953	·950	·946	·941	·938	·935
29·4	1·019	1·015	1·011	1·008	1·004	1·000	·996	·992	·988	·984	·980	·976	·972	·969	·965	·961	·956	·953	·949	·945	·941	·938
29·5	1·023	1·018	1·014	1·011	1·007	1·004	1·000	·995	·991	·987	·983	·979	·975	·971	·968	·964	·960	·956	952	·948	·945	·941
29·6	1·026	1·022	1·018	1·015	1·010	1·006	1·002	·998	·994	·991	·987	·982	·979	·975	·971	·967	·963	·959	·955	·952	·948	·945
29·7	1·030	1·025	1·021	1·018	1·014	1·010	1·006	1·002	·997	·994	·990	·986	·982	·978	·974	·970	·966	·962	·959	·955	·951	·948
29·8	1·033	1·029	1·025	1·022	1·017	1·013	1·009	1·005	1·001	·997	·993	·989	·985	·981	·977	·974	·970	·966	·962	·958	·954	·951
29·9	1 037	1·032	1·028	1·025	1·021	1·017	1·013	1·009	1·004	1 001	·997	·992	·989	·985	·981	·977	·973	·969	·965	·961	·957	·954
30·0	1·040	1·036	1·032	1·028	1·024	1·020	1·016	1·012	1·008	1·004	1·000	·996	·992	·988	·984	·980	·976	·972	·968	·964	·961	·957
30·1	1·043	1·039	1·035	1·032	1·028	1·023	1·019	1·015	1·011	1·007	1·004	·999	·995	·991	·987	·983	·979	·975	·972	·968	·964	·960
30·2	1·047	1·043	1·039	1·035	1·031	1·027	1·023	1·019	1·015	1·011	1·007	1·003	·998	·994	·990	·987	·983	·979	·975	·971	·967	·963
30·3	1·051	1·047	1·043	1·039	1·034	1·030	1·026	1·022	1·018	1·014	1·010	1·006	1·002	·998	·994	·990	·986	·982	·978	·974	·970	·966
30·4	1·054	1·050	1·046	1·042	1·038	1·034	1·029	1·026	1·021	1·017	1·013	1·009	1·005	1·001	·997	·993	·989	·985	·981	·977	·974	·969
30·5	1·058	1·053	1·050	1·045	1·041	1·037	1·033	1·029	1·025	1·021	1·017	1·012	1·008	1·004	1·000	·997	·993	·989	·984	·980	·977	·973
30·6	1·061	1·056	1·053	1·049	1·045	1·040	1·036	1·032	1·028	1·024	1·020	1·016	1·012	1·008	1·004	1·000	·996	·992	·988	·984	·980	·976
30·7	1·064	1·060	1·056	1·052	1·048	1·044	1·040	1·036	1·031	1·027	1·023	1·019	1·015	1·011	1·007	1·003	·999	·995	·991	·987	·983	·979
30·8	1·068	1·063	1·060	1·056	1·051	1·047	1·043	1·039	1·035	1·031	1 027	1·022	1·018	1·014	1·010	1·006	1·002	·999	·994	·990	·986	·982
30·9	1·072	1·067	1·063	1·059	1·055	1·051	1·046	1·043	1·038	1·034	1·030	1·026	1·022	1·017	1·014	1·010	1·006	1·002	·997	·993	·990	·985
31·0	1·075	1·070	1·067	1·063	1·058	1·054	1·051	1·046	1·042	1·037	1·033	1·029	1·025	1·021	1·017	1·013	1·009	1·005	1·000	·996	·993	·989

Correspondence.

RECOVERY OF LIGHT OIL IN THE DISTILLATION OF SHALES.

SIR,—Your issue of the 3rd inst. contains a letter from Mr. Calderwood, reflecting upon the narrative of events, which, as I had the honour of explaining to the North British Association of Gas Managers, led me to employ intermediate paraffin oil for the purpose of recovering the very volatile hydrocarbons from waste shale gases.

On first reading that communication, I thought it had such a "dog-in-the-manger" growl about it, that I determined to take no notice of it whatever; but I am now of opinion, that were I to allow the matter to pass unnoticed, I should neither be doing justice to your readers, to myself, nor to others in the employment of Young's Paraffin Light Company.

In the first place, you will observe that, although I narrated the circumstances which led to my using intermediate oil for the recovery of the *very volatile* hydrocarbons, I made no claim of novelty for using the oil, although, as I shall afterwards show, I might with perfect safety have done so. I alluded only to the process by which the oil is used as that which I claim as novel, and for an explanation of that process I referred the members of the Association to the specification of the patent, copies of which were on the table for their use. I have good reason to believe that Mr. Calderwood had a copy of that specification before he wrote to you. If he had, it is not difficult to guess at his motives for writing you; if he had not, it surely bespeaks, to say the least, a singular want of discretion on his part to dispute my claims without first making himself conversant with them.

In the specification referred to I state: "I do not claim as new, or as part of my invention, the separation and recovery of the hydrocarbon vapours from gases by means of the absorbent action of *oils*; as I am aware that heavy, or what is known in the oil trade as 'blue oil,' has been extensively applied to absorb out the vapours from gases generated when coals and shales are distilled for oil; but the means hitherto employed to employ the large volume of oil required have been such, that only a comparatively small quantity of the hydrocarbons contained in the gas has been recovered."

I think that statement should have satisfied Mr. Calderwood that I was not entirely ignorant of what was being done by his company, and it may suggest to him the propriety of, in future, "increasing his knowledge" of matters upon which he proposes to enter into controversy. In the meantime, since he has thought fit to dispute a claim which I never advanced, I think I may with perfect justice challenge the claim which he explicitly puts forward—viz., that of recovering the *very volatile* hydrocarbons by means of intermediate paraffin oils; indeed, I think I may, without laying myself open to challenge, claim as novel, the recovery of the *very volatile* hydrocarbons from shale gases by means of these oils, for this was never done by Young's Paraffin Light Company, nor, so far as my knowledge extends, by any other company. The hydrocarbon fluids which I had the honour of showing to the North British Association of Gas Managers had a mean gravity of 661° (water=1000°); and part of them, indeed, were so exceedingly volatile that, as shown at the time, they were gaseous at the temperature of the room under ordinary atmospheric pressure.

At the Clippens works we have manufactured and sold thousands of gallons of such fluid; yet, although Mr. Calderwood asserts that he has been working the *same* process for nine years, it is a fact that Young's Paraffin Light Company *never sold a gallon of similar fluid*, not because they could not sell it, for they have had inquiries for it, but because they either did not, or could not, make such a fluid by their then method of working. What they did make and sell had a much higher gravity, and was so fixed as to be entirely valueless for the manufacture of pneumatic gas.

Within the last few weeks Mr. Calderwood's company have been selling a *very volatile* hydrocarbon fluid recovered from the waste shale gases; but that has been produced by an entirely different and beautiful process, patented by their chemist, Mr. Colman; and I think Mr. Calderwood would merely have been doing justice to that gentleman in making this statement in his letter to you. And further, for Mr. Calderwood's enlightenment, I may mention that I have *data* of experiments made by Mr. Colman upon the gases at their works, showing that the process referred to by Mr. Calderwood was very far indeed from being perfect, or able to take up the *very volatile* hydrocarbons contained in these gases.

Clippens Shale Oil-Works, Paisley, Oct. 21, 1876. WM. YOUNG.

SIMULTANEOUS PHOTOMETER CLOCK AND METER ACTION.

SIR,—I have adopted a much more simple arrangement than Mr. Warner's, for simultaneously setting in motion the photometer clock and meter, and one which does not necessitate the alteration of any of the apparatus. I simply form a bye-pass to the meter, by connecting the inlet with the outlet, and place a cock in this bye-pass, and to it I fix a cord, which, running over the necessary pulleys, is attached to the action for stopping and starting the clock. When the bye-pass cock is open, the gas goes to the burner without passing through the meter, and

the closing of the cock immediately starts the meter and the clock. Mr. Warner's three cocks are unnecessary, for the gas will, of course, never pass through the meter if it can find any easier passage to the burner. My plan for getting the hands together is to arrange the cord on the bye-pass cock, so that the clock is not started till the cock is *fully* turned off, so that, when only *partially* turned off, some gas passes through the meter, and when the meter-hand comes up to the clock-hand, the cock is opened, and both are stationary and together.

Gas Office, Leicester, Oct. 20, 1876. G. GOLDSMITH.

SOUTH METROPOLITAN GAS ACT, 1876.

SIR,—Will you allow me to call attention to the fact that section 12 of the South Metropolitan Gas Company's Act of 1869, which says that "the profits of the company to be divided among the shareholders in any year shall not exceed the rate of ten pounds per centum per annum," does not appear to be repealed by the company's Act of this year. The repealing section of the Act of this year is section 10, and it runs thus: "Sections 13 and 14, and sections 19 to 66, both inclusive, in the Act of 1869, are hereby repealed."

Section 12 of the Act of 1869 is thus left unrepealed. It is true that the provisions in this year's Act conflict with, and, I suppose, override, the unrepealed section; but, as it is the invariable practice to repeal sections which are not intended to remain in force, and with which new provisions conflict, it occurs to me that the omission in this case might possibly, under certain circumstances lead to difficulty. I bear in mind the litigation, some years ago, between The Gaslight and Coke Company and the Vestry of St. George's, Hanover Square, which, if I remember rightly, turned upon the question whether a certain provision in the Act of 1860, which was not completely repealed, but which was plainly at variance with the newer legislation of 1868, could be held to be in force.

There is another provision in the Act of this year which I do not quite understand. Section 64 says that the company may "amalgamate its undertaking with that of any other company supplying gas in the Metropolis, on the south side of the Thames, except the Crystal Palace District Gas Company." According to this the company are at liberty to amalgamate with the Wandsworth and Putney Company, the West Kent Company, and the Woolwich, Plumstead, and Charlton Company, all of whom supply parts of the Metropolis on the south side of the Thames; but with the Crystal Palace Company, whose district is immediately adjoining, the company must not amalgamate. Why this curious exception?

Clapham, Oct. 18, 1876. H.

Parliamentary Intelligence.

HOUSE OF COMMONS COMMITTEE.

TUESDAY, MAY 16.

(*Before Mr.* ELLICE, *Chairman; Mr.* W. H. GLADSTONE, *the Marquis of* HAMILTON, *and Mr.* WROUGHTON.)

WAKEFIELD WATER BILL.

(*Continued from page* 562.)

Professor *John Attfield*, cross-examined by Mr. SALISBURY.

I have heard the evidence that has been given about the boilers used at Wath Main. I heard it stated that there was no incrustation upon those which have been in use three years. I am not prepared to deny it. I have heard the evidence given here about the rocks by Professor Ansted. I know him to be a great geologist. I have not gone down to the Wath Main pit. I got these samples of rock from the pit mouth. I do not know that there are limestone rocks in the neighbourhood of Wakefield. I know there is carbonate of lime in this rock bind. Supposing all these different waters at Wath were mixed together, and all put into one well, I say, as I have already said, that it is of inferior quality for potability, and that it is not good water for domestic use, nor for manufacturing purposes. It is about the same degree of hardness as the present water at Wakefield—12 or 13 degrees by my own analyses. I heard the evidence given by Mr. Poppleton and Mr. Marriott, and saw what they produced by way of samples. I also heard it stated that the Balne Beck were waters that were being used by the Messrs. Marriott in their trade when they were carrying on their business, and also that their goods, both as to colour and quality, were accepted all over the world as about the best. I have heard them state that opinion, and I am not prepared to deny what they have said. It is a fact that you can dye better with good water than with bad, although you may dye with bad water. I say that this is bad water. I have heard them state that they beat their competitors with this bad water, but I am quite sure that even they themselves, using better water, would produce a still better colour. My attention has been called to the London water, and its incrustation upon the boilers. I think there is no carbonate of soda in the New River water. I heard the evidence of Dr. Tidy, Dr. Odling, and other chemical witnesses, in this room, to the effect that the carbonate of soda in this water affects materially its influence upon boilers. I do not agree with that evidence, and I will give my reasons for it. The lime and magnesia in this water probably, as already stated, occur as carbonates, and the carbonate of soda as a bicarbonate. When such water is boiled there is no chemical reaction between the carbonate of soda, the carbonate of lime, and the carbonate of magnesia. The action which does take place is this—the carbonic acid which holds the carbonates of lime and magnesia in solution is dissipated with the steam, and then these two carbonates are deposited in a more or less crystalline, or a more or less hard condition. The action which carbonate of soda has in influencing deposits in boilers is this—it has an action upon the lime and magnesian compounds when the lime and magnesia occur as chlorides. Then there is a reaction between the substances, and the carbonate of lime is deposited in a more or less muddy condition, and it is the same with the carbonate of magnesia. But as I have stated, in the Wath Main water the lime and magnesia probably occur as carbonates dissolved in carbonic acid, and there is no reaction whatever between these calcareous and magnesian compounds and the carbonate of soda. The deposit that occurs in boilers in which this Wath Main water is heated can be removed, and fairly and easily removed, if proper attention is frequently paid to such boilers. And if the deposit is frequently washed out, then you will have little or no incrustation contained in such boilers. But the absence of incrustation in boilers in which the Wath Main water is boiled only shows to me that the boilers have been properly and frequently cleaned out.

Mr. SALISBURY: I believe you were not altogether content, were you, with your own examination of the water?

Witness: Perfectly content. I most certainly did not want it revised by another chemist. I did not send a sample of the water to another eminent chemist, or to Dr. Letheby. I have never received a report from Dr. Letheby of the result of his analysis of water sent by me to him for analysis. I never sent a sample of the water to Dr. Letheby either on April 9 or any other day of this year, or any previous year. I have never seen any sample of water or of Wakefield water submitted to Dr. Letheby by any other person, and analyzed by him. The only sample I obtained personally was on the 9th day of April. In these samples that were sent to me or taken by me, the evidence points to the absence of any material quantity of sewage. I found in these various samples of water an amount of what is commonly termed "albumenoid ammonia," represented by the figures 0·002 and 0·003. That is a quantity which renders the water a first-class water, so far as the absence of sewage goes.

Cross-examination continued: The analyses which have been produced before the committee show, in my opinion, a water which is of inferior quality, as regards potability, and bad quality as regards domestic use and manufacturing use. I am not a medical man. Dr. Frankland is a very good authority on the question of water. I know Harvey and Reynolds, chemists, of Leeds. I receive samples of water from them very often. I believe that some of these samples of water which I have described as coming from the town-clerk, came through certain hands—Harvey and Reynolds, amongst the rest. I have not the slightest idea whether they sent the water to Dr. Letheby. I received an analysis made by Dr. Letheby of water called the Wath Main water, which Mr. Reynolds submitted to me.

Mr. SALISBURY called for its production.

Mr. MICHAEL said he knew nothing whatever about it, and asked how it could be evidence.

Mr. VENABLES stated that it was an analysis made by Dr. Letheby, and signed by him, and the promoters suggested that the opponents procured an analysis of the water from Dr. Letheby, and kept it back.

The CHAIRMAN suggested that the witness should explain how Dr. Letheby's report came into his possession.

Witness: It was sent to me by Harvey, Reynolds, and Co., of Leeds. I received with that a question, viz—"Enclosed is an analysis of Wath Main water made by Dr. Letheby. Will you state to what extent your analysis differs from it, and whether you draw any different conclusions?" I think that was about the wording of the letter. Messrs. Harvey and Reynolds did not state for whom they were acting. It was not brought to my knowledge that the corporation—that is, the town-clerk, had procured from Dr. Letheby an analysis of the water. I said my samples of water came from the town-clerk through various hands. My samples of water were marked "I. S." and "W. D." The water was contained in two Winchester stone bottles, labelled "W. D." It was not brought to my notice that this analysis must have been got on behalf of the Corporation of Wakefield.

The CHAIRMAN stated that the presumption in the mind of the committee was that it did come from the Corporation of Wakefield unless they were in a position to deny it.

Mr. MICHAEL: Without looking at it, I will ask you, is there in that analysis any material difference between your analysis and his?

Witness: No.

Mr. MICHAEL: Had you any reason for withholding from the committee this document?

Witness: Not the slightest.

Mr. MICHAEL: Does this impeach your analysis in any way?

Witness: Not the slightest. It seems to me to show very much the same figures. There was no object on my part in withholding it from the committee.

The CHAIRMAN observed that the opinion of Dr. Letheby appeared to be in great antagonism to that of the witness.

Mr. MICHAEL stated that it appeared from the evidence that Dr. Letheby had told Dr. Tidy that he thought it a most valuable water. Therefore, what object could there be in withholding the document?

The CHAIRMAN said that the committee would like to have the benefit of the analysis of Dr. Letheby, if there was no objection to put it in.

Mr. MICHAEL stated that there was no objection.

Dr. Letheby's report was then handed in, and is as follows:—

Saline and other Constituents per Imperial Gallon.

	Per Million.	Grains.
Actual or saline ammonia	0·03	0·002
Ammonia from organic matter	0·06	0·004
Nitrogen as nitrates		Trace.
Lime		4·816
Magnesia		2·018
Alkalies—chiefly soda		8·971
Chlorine		7·304
Sulphuric anhydride		4·034
Carbonic anhydride (combined)		5·625
Silica, alumina, and oxide of iron		1·200
Total saline matter		33·968
From which deduct the oxygen equivalent of chlorine		1·646
		32·322
Organic matter (determined by oxidation)		0·160
Total solid matter per gallon		32·482
" " obtained by evaporation		32·533
These were probably combined as follows:—		
Carbonate of lime		8·100
" magnesia		3·935
Sulphate of lime		0·680
" magnesia		0·497
Sulphates of alkalies—chiefly soda		5·939
Chloride of sodium		12·036
Silica, alumina, and oxide of iron		1·200
Organic matter		0·160
Total solid matter per gallon		32·547
Degree of hardness		9·5
" " after boiling a quarter of an hour.		1·9

Report of Analysis of a Sample of Water from Messrs. Harvey, Reynolds, and Co., Leeds.

The water was contained in two Winchester quart bottles securely stoppered and sealed, and labelled "W. D.," Harvey, Reynolds, and Co., Leeds. One of the bottles was received at the laboratory on the 9th of March (inst.), and the other on the 11th.

The water was somewhat turbid from the presence of a little peroxide of iron and very fine white sand, but on standing for a few hours this subsided and left a supernatant water, which when examined in a large volume, as in a glass tube 2 feet in length, was found to be almost colourless, and quite free from organic taint. It was also free from odour and was very palatable.

The saline and other constituents per imperial gallon are tabulated on the next leaf, and they show that the water is absolutely free from organic pollution. The saline matters are chiefly soda salts, which are perfectly wholesome, and they are no doubt derived from the white silicious strata of the coal residues. This is, in fact, indicated by the fine white sand which subsides from the water on standing.

In my opinion the water is remarkably pure, and is excellently well suited for all domestic and manufacturing purposes. It is a perfectly wholesome water, is fit for brewing and malting, for cloth manufacturers and dyers, for boiler and engine purposes,

and for yarn spinners. I have indeed rarely analyzed a water so free from pollution and so well adapted for manufacturing purposes.

HENRY LETHEBY, M.B., M.A., &c.,
Professor of Chemistry in the College of the London Hospital, and late Medical Officer of Health and Public Analyst for the City of London.

London Hospital College Laboratory, Turner Street, Whitechapel, March 23, 1876.

The CHAIRMAN stated that the committee were glad to have Dr. Letheby's opinion, as there was an end of it. The committee entirely acquitted all parties from blame in the matter.

Re-examined by Mr. MICHAEL: I know something of the Leigh water from Hudson's pit, for I have analyzed it. It has 8° of permanent hardness. I have an analysis of the Holmfirth water, which was before Parliament for the supply of Wakefield last session.

The CHAIRMAN said the committee had nothing to do with any other water than that before them.

Professor *James Alfred Wanklyn*, examined by Mr. LITTLER.

I have had about 20 years experience as a chemist, and for the last nine years I have made analysis a speciality. I have received four samples of water from Wath Main. One sample I received on the 28th of March, and another sample I took myself from Wath Main on the 9th of April, from the top of the pump as the water issued, and the third and fourth samples were delivered to me last Monday morning. The two latter ones are incomplete. They show an extraordinary variability in the quality of the water, indicating a varying amount of common salt in the water. It indicates an immense alteration in the quality. The analyses show that 3 million gallons of water raised daily about the 28th of March contained 2 tons of common salt, and that 3 million gallons of water raised daily about the 9th of April contained about 1 ton of common salt, and on the 14th of May 1 ton 1 cwt. of common salt.

By the COMMITTEE: Then your analyses differ very much from the previous analyses of Professor Attfield?

Witness: No, they are substantially the same.

The following tables were handed in:—

Professor Wanklyn's Analysis of Water,

Sent by Henry Morgan, Esq., Town-Clerk of Wakefield, on behalf of the Corporation of Wakefield, and received March 28, 1876.

Free ammonia	0·28 part per million.
Albumenoid ammonia	0·04 " "

One gallon contains 32·7 grains of mineral matter, dry at 150·6°. On subjecting these 32·7 grains of mineral matter to the solvent action of a moderate quantity of boiling distilled water, 23 grains enter into the solution.

The mineral matter in a gallon of the water, therefore, consists of—

	Grains per Gallon.
Insoluble solids	9·7
Soluble sodids	23·0
	32·7

Further analyzed, these 32·7 grains of solids were shown to consist of—

	Grains per Gallon.
Silica, alumina, and oxide of iron	0·8
Carbonate of lime	5·0
Carbonate of magnesia	3·9
Carbonate of soda	8·7
Chloride of sodium	10·7
Nitrate of soda	0·2
Sulphate of soda	1·6
Sulphate of potash	1·8
Hardness, 12 degress.	32·7

Professor Wanklyn's Analysis of Water,

Obtained from Wath Main Colliery Shaft at Wath-upon-Dearne, on April 9, 1876.

One million parts of the water yielded—

Free ammonia	0·20
Albumenoid ammonia	0·03

The mineral contents of the water yielded—

	Grains per Gallon.
Insoluble solids	10·9
Soluble solids	14 7
Total solid	25·6

Further analyzed, these solids were found to consist of—

	Grains per Gallon.
Silica	0·6
Carbonate of lime	6·3
Carbonate of magnesia	4·0
Carbonate of soda	4·0
Chloride of sodium	5·1
Nitrate of soda	0·2
Sulphate of soda	2·4
Sulphate of potash	3·0
	25·6

Hardness, 14 soap degrees (13 degrees on Dr. Clark's scale).

Examination continued: The result of these various analyses satisfies me that from time to time there is a variable difference in the quality of the water, that the water is not the same, and that part of that water cannot have been drawn from a great underground reservoir. The composition of the water would be uniform if it were taken from a reservoir. It is certainly taken from fissures, or something of that kind, not from the main body, but from small bodies of water. The water from Wath Main, when it is boiled and evaporated, and five volumes reduced to one, becomes very morbid from the deposit of carbonate of lime and magnesia. [Producing a sample.] It is a bad water both for drinking and manufacturing purposes. I could precipitate this in a few minutes. If I had a small quantity of water and a large flame, I would evaporate it in a very few minutes. Here I have another specimen. I took a pint of water and reduced it to this bulk.

By the COMMITTEE: What is that bulk?

Witness: About two ounces. That residue is the insoluble residue, or that which would be deposited on the boiler. There is probably a trace of salt adhering to that upon throwing out the water. That is the carbonate of lime and carbonate of magnesia, nothing else.

Mr. LITTLER: What is that pot which you are producing?

Witness: I have taken between five and six gallons of water and boiled it down to about a gallon. Of course I added the water gradually. Then I throw out half a gallon, and here is the incrustation [producing same]. The pan was a new pan. Observe, it is under the most unfavourable circumstances for a deposit that you could have. This is the deposit, and it sticks.

The COMMITTEE: Is it not the same deposit as the other?

Witness: It is the same deposit; there may be traces of salt left on the other, for I merely dashed the water out. If there be any common salt in that, it will amount to 1 per cent. of the whole deposit.

Mr. LITTLER: You say this is a deposit very different in quality to the platinum deposit?

Witness: It is the same deposit, only one is the deposit formed in the course of many hours, whereas the deposit in the platinum was deposited quickly.

Mr. LITTLER: How long was it boiling to get the deposit in the platinum?

Witness: About two hours, but the quantity taken was a pint. The volume was up to the rim.

The COMMITTEE: You evaporated it by that quantity, four out of five?

Witness: I evaporated a pint down two ounces. I should mention that you could get something else from water. If you take water and evaporate it to dryness you obtain the total solids, but that is totally different to what you get from this. That would not be a fair test, that is an insoluble solid.

Mr. LITTLER: Having regard to all these facts, in your judgment this is not a suitable water for domestic or for manufacturing purposes?

Witness: Certainly not.

Mr. LITTLER: What do you say to the presence of carbonate of soda, when you find the carbonates of lime and magnesia; does that prevent incrustation?

Witness: Not at all. Carbonate of soda prevents incrustation when sulphate of lime is present, but when, as in this water, there is sufficient carbonic acid to combine with the lime, the carbonate of soda has no effect whatever. The presence of carbonate of magnesia forms an incrustation, for carbonate of magnesia is very much more soluble in water than carbonate of lime, and the circumstances under which you get solid deposit, or adherent deposit, are a slow deposit. If there was only carbonate of lime present when the carbonic acid has escaped, there will be three or four grains of carbonate of magnesia left in the water, which you only get out slowly by evaporation, and it is that which causes magnesian water to be very dangerous in an industrial sense. I object to the water most strongly. The water is not a drinking water, but a mineral water. It is the kind of water that invalids might take at a Spa, but it is not a proper water to use for drinking purposes. The amount of magnesia in it is very nearly as much as the amount of magnesia in the celebrated Buxton water from St. Ann's Well. There is nothing active in the Buxton water except the carbonate of magnesia and the sulphates. There are rather more sulphates in this water than in the Buxton water. Four grains of carbonate of magnesia are also accompanied with about 12 grains of Glauber's salts. That assists in making it an industrial rather than a drinking water. When the carbonate of magnesia is in solution in the water, the Glauber's salts are also in solution. There is no doubt a division of the acids, and, although in the total residue from the water we have no sulphate of magnesia, yet we have some sulphate of magnesia in the water itself.

Mr. LITTLER: Now, as far as you know, are small proportions of these various salts unprecedented in any general water supply in any considerable town in the country?

Witness: I know of no parallel case. There is more magnesia in the Sunderland water, but it is almost devoid of salts. It is as pure as the New River Company's water. I get the same figures for sulphates in Sunderland as I do in the New River water. This is not such a supply as I would recommend any one to spend £150,000 for the purpose of bringing it to a large town—not for the benefit of the town.

The COMMITTEE: For whose benefit, then?

Witness: Competing towns. If it were desired to benefit competing towns, I should advise this water to be taken.

Mr. LITTLER: If you found other towns with soft water which were competing in manufactures with this, then you think you would be doing a benefit to those towns?

Witness: Yes.

Cross-examined by Mr. VENABLES: I suppose you mean that as a joke, and would do good to other towns to the injury of Wakefield?

Witness: Not necessarily. I received this sample of March 28th from the town-clerk of Wakefield. He did not state when he took it but I have heard. I believe it was taken from the channel, and not from the top of the pump. I do not remember Dr. Frankland's description of the place, but I found the water wonderfully free from organic matter. I took some myself from the pump on the 9th of April. I thought there could be no question whatever of water taken from the pump. I thought there might be a question which might require investigation of water taken from the channel.

Mr. VENABLES: I do not know whether you had your attention called to the evidence of several of our witnesses as to the place where the corporation samples were taken from. They said it was not a fit place, and that the water there was subject to contamination.

Witness: I found the water I took remarkably pure in an organic sense from both places. I received last Monday a sample from the top of the pump, and the analyses are now identical. I was informed that it was taken from the channel, but I cannot tell; Mr. Morgan will explain where it was taken from. The samples do not differ at all in the figures. These two tons of common salt represent ten grains of common salt to a gallon. Three million gallons of water will give, as nearly as can be, ten grains of common salt to a gallon. I was not aware that between the 28th of March and the 9th of April the tubbing was put down the shaft. It is quite certain that there must have been some immense difference in the conditions. My contention is that the water must have been totally different water which was taken on the 28th of March from the water taken on the 9th of April. I do not think that the engineer in charge told me that the water which had previously been flowing had lately been tubbed out. I do think I said a word to the engineer in charge. I looked into the pit, and, as far as I could see, it was tubbed when I was there on the 9th.

Mr. VENABLES: You had not inquired whether it had been tubbed when the previous samples were taken?

Witness: I presume it had been tubbed when the previous samples were taken, and, from the account I have heard in this room, it must have been partially tubbed, at any rate. My analyses prove that the water that was delivered from the Wath Main on the 28th of March was a totally different water from the water that was delivered on the 9th of April. My analyses prove that I am not otherwise aware that they were taken from different sources. The proportion of the weight of water to the weight of salt is 1·7000, or 10 grains to 70,000. The turbid water is produced by taking five volumes of the Wakefield water and evaporating off four volumes.

Mr. VENABLES: Supposing you were to perform that operation with London water—say, with water from the Kent wells—what would happen?

Witness: You would get very much the same, with only slight difference. This deposit consists of carbonate of lime and magnesia, in about equal portions. I deny altogether what has been said by the chemists called for the promoters, that there is much less apparent hardness in this than in London water. The Wakefield water is very nearly as hard as the Thames water, or as the New River Company's water. The total hardness is very nearly the same. The Thames water varies from 14° to 17° of hardness. One of my samples was 12° and the other was 13°. That is in grains to a gallon. The permanent hardness is very much higher than the permanent hardness of the London water. It is about 7°. I deny the result that has been got of 2° of permanent hardness. I can explain how it has been obtained. The determination is wrong, not because Mr. Attfield has done the work badly, but because the method is bad, and because the method is false for magnesian water. The permanent hardness of the water is this: Suppose you have a water containing carbonate of lime held in solution by carbonic acid, when you boil off the carbonic acid you will precipitate the lime, and there will remain one or two grains of it in the water. That shows that the permanent hardness of the water contained nothing but carbonate of lime. Supposing the water contains carbonate of magnesia, and you do nothing but boil off the carbonic acid, there will remain three or four grains of carbonate of

magnesia, which give a hardness of 6° or 7°, because one grain of carbonate of magnesia hardens water as much as 1¼ grain of carbonate of lime, and the permanent hardness of magnesian water cannot be less than 6° or 7°. Mr. Attfield made the experiment of four grains to the gallon, and his result was perfectly right. I do not differ from him at all. Mr. Attfield used a process which is known to be invalid, and gave you the results of using that process. We agree as to the invalidity of that process. The practical meaning of hardness is its effect upon the use of soap. It destroys soap. I took the total hardness with the soap test. I did not take the hardness after boiling, because I knew that the result is invalid. Permanent hardness is better got by calculation than by experiment. I have here two samples by Dr. Tidy—one reported in Sept., 1875, and the other in April, 1876. One of them is—hardness after boiling 15 minutes, 2·27°; and the other 1·71°.

Mr. VENABLES: Can you explain that?

Witness: Perfectly well. If you want to take the permanent hardness, you take a volume of water and boil it. The ordinary process is to let the steam escape; afterwards you restore the water that has evaporated, decant or filter it, and take the hardness of the resulting product. But that is invalid, because the water that is held by the carbonate of magnesia in solution does not hold it in solution; the water that you restore is not saturated with carbonate of magnesia, unless you go to a great deal of trouble to make it saturated. I cannot, without much trouble, take the permanent hardness of this water by the soap test, but I have worked specially upon this subject, and knowing the trouble it takes I always deduce. A great deal of the difference of chemists is the difference in the mode of experiment; but a great deal of the difference is the difference of interpretation. On the other side they have underrated the total hardness of the Wakefield water, and they have given the permanent hardness falsely. They have given it two degrees, where it is seven. In producing steam, it is the practice to evaporate away the water, and to evaporate immense quantities of water. Very much more than five to one. From the evidence I have heard, it is the practice at Wath Main, as much as possible, to use rain water for boilers. All the boilers in Wath Main were supplied wholly or partially with rain water, I believe. The water is reported to have got into a well, and to have been pumped out. If these boilers have been supplied with the water that is at present discharged, I have very little doubt there would have been incrustation in both cases. If they have not encrusted it is because they did not receive the water that is coming from the pit now. I am aware that this water, which I say is very objectionable, was said by Dr. Frankland, Dr. Odling, and Dr. Ogston and Professor Way to be an excellent water to supply, and I think they said so without due consideration. Most of those gentlemen are not capable of pronouncing an opinion on the water from a sanitary point of view, and, with great deference to Dr. Tidy, I should prefer my own opinion. Dr. Crichton Brown admitted that five or six grains of magnesia ought not to be in a drinking water.

The CHAIRMAN stated that these were matters of opinion. The committee understood that this witness condemned the water.

Mr. VENABLES: I see that what Dr. Brown says is, that anything above 15 grains would be objectionable? He said anything above 5½ first. That 15 grains was afterwards. I was paying very close attention to it. I do not think Dr. Odling a judge of such matters.

The CHAIRMAN stated that he did not consider this witness's opinion of the opinion of another gentleman of any value.

Re-examined by Mr. LITTLER: If a number of the boilers had been used for three years, and there had been no furring, it would be conclusive evidence that they had not been using the same water. It is an inevitable result that such water must fur in a general way. It only shows the variable nature of the water; that is my contention. The town-clerk took two samples of it last Sunday; I received them on Monday morning, and I examined them critically. There is no difference between the two sources.

The CHAIRMAN: The deposit on the pan you have shown us is a precipitation?

Witness: Yes. That precipitation, in the case of boilers, in time would form the insoluble incrustation that has been shown in the case of Professor Attfield. The only difference is that the incrustation that is serious is thicker than that.

Dr. *Theophilus Redwood*, examined by Mr. LITTLER.

I am Professor of Chemistry and Pharmacy to the Pharmaceutical Society of Great Britain. I have had some 30 years experience as an analyst, especially with reference to the quality of the water supplied to towns. I have examined the Wath Main water supplied to me by Professor Wanklyn, and I have, to a certain extent, been cognizant of the examination that was made by my colleague, Professor Attfield. I agree generally with Professor Attfield as to the composition of the Wath Main water, and also as to its hardness, by Dr. Clark's test, both before and after boiling I consider that it is a hard water, and I consider the hardness is caused wholly or partially by magnesia, which is more objectionable than when it is caused by lime. I have met with cases in which comparatively small quantities of salts of magnesia in drinking water have proved injurious to health. Some years ago I was called upon to make an analysis of the water supplied to the Lambeth Workhouse, on account of its having been found that certain of the inmates complained of irritation of the intestines, which it was thought might probably have been caused by the water. I found a somewhat larger quantity of magnesia in that water than in this. On changing the supply the effects complained of ceased. It was taken from a well on the premises. Another case of a similar description came under my notice some years ago, in the establishment of a private family near Epsom.

Mr. LITTLER: Do you believe that the injurious effects of the lime and magnesia are diminished by the presence of carbonate of soda, or any other alkali, provided the lime and magnesia be present in a state of carbonate?

Witness: No; I consider that the furring effect is rather increased than diminished.

Mr. LITTLER: You do not think that in any way carbonate of soda improves the water if carbonate of magnesia or carbonate of lime are present?

Witness: No, I do not.

Mr. LITTLER: If they exist as sulphates, I think you agree that the carbonate of soda does assist in getting rid of their effects?

Witness: Yes; it precipitates the carbonate of soda and the sulphates rapidly, and is not so likely to form a fur, as would otherwise be the case.

Examination continued: I confess that it does not appear to me that there is any sufficient evidence, from the examination of the water at Wath Main, that the water obtained at the distance of a mile and a half would be the same. My reason for thinking that this water is likely to contain magnesia is, that magnesia is contained in the rock which underlies the surface to some extent; and although there would be no certainty that, at a new situation, the water would be identical, in that position there is every reason to believe that it would be similar, as regards the nature of the inorganic substances contained in it. This is not such a scheme as I should be prepared to recommend to the authorities of large towns as a suitable source of supply for years to come.

Cross-examined by Mr. SALISBURY: I heard Dr. Tidy's examination. I differ from him entirely. I am not a medical man nor a geologist. I examined the Lambeth Workhouse water simply as a chemist, so as to enable the medical men, from my analysis, to determine the cause of the disturbance it occasioned.

Mr. *Dugald Campbell*, Dr. *W. S. Saunders*, and Dr. *W. O'Connor* were examined, and expressed opinions generally unfavourable to the Wath Main water, on the ground that it was a hard water, and unfit for the use of manufacturers.

Dr. *W. S. Wade*, examined by Mr. MICHAEL.

I am now, and have been for ten years past, the Medical Officer of Health for the Urban Sanitary Authority of Wakefield. I have carefully considered the analysis of the water proposed to be supplied to Wakefield, and I have considered it my duty as the medical officer to protest against such water being supplied for domestic use. I consider that water containing salts of magnesia and soda, if used habitually for drinking purposes, would cause various diseases and disturbances of the digestive organs, especially diarrhœa, attacking the mucous membrane of the stomach and bowels. I have had under my personal observation cases which terminated in death, caused by the habitual use of carbonate of soda as a supposed corrective of acidity. I think the habitual use of water containing sulphate of magnesia or other saline in solution, would cause chronic diarrhœa and keep up a perpetual irritation of the mucous membrane, which would be prejudicial to health. The habitual use of water containing from 4 to 5 grains of carbonate of magnesia per gallon would probably lead to secretions, and certainly would be favourable to the production of stone or calculus in the bladder. I think this water would increase the deaths, especially in the infant population, and also among elderly people. I think it would shorten the average duration of life in the district. My return of the annual death-rate per 1000 for the year 1875 in Wakefield was 31·56. That is a high death-rate, but I should say we had a very severe epidemic of scarlet fever last year, which raised our death-rate very considerably. It is not a fair year to take, on that account.

Cross-examined by Mr. SOMERSET: The Corporation of Wakefield pour all the sewage of the town into the river, above the present intake of the water company. I have remonstrated against it, but it is still done. I believe the quantity of carbonate of soda, which appears in the promoters analyis of the Wath Main water, would have a prejudicial effect upon health. I do not know of any town which uses water with the same proportion of carbonate of soda in it. I do not recollect that I have expressed an opinion in favour of deep well water.

Re-examined by Mr. MICHAEL: I should prefer water from the sandstone rock to that supplied by gravitation, and run the risk of contamination by sewage.

By the COMMITTEE: When I remonstrated about the sewage being put into the river above the town, I was met with the reply that, under existing circumstances, it was impossible to do otherwise, as there was no other method of getting rid of it. The supply of bad water in Wakefield at the present time tends to increase the death-rate there.

On the following day, and on Monday the 22nd of May, the evidence for the petitioners was continued. The witnesses were worsted manufacturers, mining engineers, the borough surveyor, and the mayor.

On Tuesday, the 23rd of May Sir E. BECKETT, summed up the case on behalf of the corporation, and the COMMITTEE, after hearing Mr. VENABLES in reply, declared the preamble of the bill proved.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

SHOREDITCH VESTRY.

ALLEGED NUISANCE AT THE HAGGERSTON GAS-WORKS.

At the Ordinary Meeting of the Vestry, on Tuesday, the 17th inst.—Mr. J. DEATH in the chair—

A deputation, from a meeting of the inhabitants of Great Cambridge Street and its vicinity, attended to make a complaint of a nuisance arising at the Haggerston station of The Gaslight and Coke Company, and to request the vestry to take such steps as they might deem necessary to abate the evil.

Mr. CRITCHFIELD, who introduced the deputation, stated that they had been appointed by a large meeting, which was held on the previous Friday evening, to wait upon the vestry, and complain of an intolerable nuisance caused by the escape of noxious effluvium from the adjacent gas-works. What caused the effluvium he did not know, but the effects were so powerful that brass knobs 100 yards from the works were turned black, and a pool of water at the bottom of Great Cambridge Street had been covered with a filthy green film. Not only had the inhabitants of Shoreditch complained of the nuisance, but some of the residents of Hackney had called the attention of their medical officer, Dr. Tripe, to it, and that gentleman had visited the works in company with the medical officer of Shoreditch, Dr. Sutton. He sincerely hoped the vestry would take immediate steps to abolish or alleviate the nuisance, otherwise much damage would result to the lives and property of the neighbourhood.

Mr. GILLETT, a member of the deputation, said the meeting on the previous Friday was a very crowded and unanimous one, although the bills announcing the meeting were only issued on the Thursday. The nuisance had existed for two or three months, and during the last week it had been intolerable. He could name cases in which the effluvium had not only affected the health of women and children, but that of men also. It affected articles of food, and its influence extended for a considerable distance.

Mr. F. HARDING remarked that, although he had been a ratepayer of Hackney and Shoreditch since 1848, he had never smelt anything so intolerable as the effluvium which emanated from the gas-works.

The CLERK said that, in company with the medical officer, Dr. Sutton, he had visited the gas-works, and, having had a conversation with the engineer, they had prepared a report, which he would read, and that, perhaps, would place matters in a right manner before the vestry. He then read the following report:—

On Monday morning, the 9th inst., information was received by the sanitary officers, that during the night of Sunday a most offensive nuisance had been caused by the Haggerston Gas-Works (Great Cambridge Street); complaints were made by many persons, and the whole district, including even Hackney, was greatly alarmed. The medical officer and inspector immediately visited the works, and had an interview with the engineer, who explained the cause to the medical officer, and promised, that though he was working under great difficulties, the nuisance should not, if possible, be repeated. It was not particularly discernible on the following day or night, but it recurred on Tuesday night, almost if not quite as bad as on Sunday. On Wednesday morning, the medical officer, after consulting the vestry-clerk, served a notice on the company to discontinue forthwith the process causing the nuisance, failing which, the promptest legal steps would be taken to restrain the company from proceeding with such operations. Since that time the nuisance does not seem to have occurred with any marked intensity, although symptoms of it have appeared, but it is more than probable that unless the operations causing it are discontinued, it will recur almost constantly and with greater intensity during the winter.

From an inspection of the premises by the medical officer and the vestry-clerk, and from conversations with the engineer, the facts of the case seem to be these:—Coal gas as it comes from the retort contains a variety of impurities, which have to be removed before it is delivered to the consumers. The most conspicuous and offensive of these is sulphur, in some form or other, and the worst of all forms is sulphuretted hydrogen. This is a gas easily detected by its filthy odour, and in the smallest quantities, by the simplest of chemical tests. It can be entirely removed, economically, and without causing any, or but the slightest, nuisance, and it is for these reasons entirely prohibited by Act of Parliament from London-made gas. The means by which this impurity is, or ought to be, removed is the filtering of the gas through oxide of iron. But there are other sulphur impurities, the presence of which can only be detected by delicate and tedious chemical experiments, and these exist in gas after the iron process of purification has been completed, in amount varying from 30 to 40 grains of sulphur per 100 feet, which some eminent chemists declare is practically an inappreciable and harmless quantity. The Gas Referees appointed by the Board of Trade have the power to fix the amount of impurity to be

allowed, and they have, as regards sulphur, fixed it at 15 and 20 grains, relatively, in summer and winter, in the outlying works at Beckton and Bromley, and at 20 and 25 grains, relatively, for summer and winter, in the town works where lime cannot be freely used. It is the removal of the excess of sulphur over 25 grains at the Haggerston works—probably from 7 to 10 grains per 100 feet—that, as we are informed, causes all the difficulty and nuisance. Sulphur in this form, according to the Gas Referees, can by no known process practicable on a large scale be eliminated, other than by passing the gas through lime which has already been fouled by sulphuretted hydrogen. For this purpose, and in order to supply gas of required purity, the company have recently erected, in Great Cambridge Street, a series of extensive lime purifiers. In the course of a few days—from five to ten—the lime contained in them becomes completely saturated with sulphur in its most volatile and offensive forms. When this is the case, it becomes necessary to open the tanks to the air before workmen can enter to remove the foul lime; and the gas which is given off, when the tanks are so opened, is the nuisance so complained of, and there is no doubt that it is a most foul, offensive, and dangerous poison, which ought not to be allowed in any urban district. The Gas Referees speak emphatically in their reports of the use of lime as causing "a most intolerable nuisance;" but they make in their standards an allowance of only 5 grains of sulphur per 100 feet between the works of Beckton—some miles from London—and Haggerston, St. Pancras, &c., in the very midst of the population.

By the Gas Act of 1860, the companies were bound to supply gas containing not more than 20 grains of sulphur per 100 feet, but, as a matter of fact, the companies never did so. At any rate, the referees admit that the violations of the Act in this respect were of daily occurrence. By The Gaslight and Coke Company's Act, 1876, under which the Haggerston works are now carried on, the referees "shall from time to time ascertain with what degree of purity the company can reasonably be required to make and supply gas continuously, without occasioning a nuisance to the neighbourhood in which the works are situate, and shall thereupon prescribe and certify the maximum of impurity" to be allowed. Now if the information which the company's engineer has given respecting the means of purifying and the cause of this nuisance be correct, then it is clear that the referees have prescribed a degree of purity which cannot be attained at town gas-works without causing a great and continuous nuisance, and in so doing have violated the very terms of the Act itself. We are informed by the engineer that the nuisance is only temporarily abated, and that as the winter approaches it will be repeated with greater intensity, so long as the lime process is continued. Whether this be a fair statement of the company's difficulties, or an exaggerated one, we cannot say; that is a matter which the company and referees may settle. As the nuisance is such as to be intolerable, and having regard to the alleged cause of it, the only means which we can suggest for its prevention are—an immediate reference to the Board of Trade and to the Gas Referees, also to the company, setting forth the facts and explanations above given, and requiring the immediate discontinuance of the process which causes the nuisance, and, in the event of these not having the desired effect, an application should be made to the Court of Chancery to restrain the Gas Referees from prescribing such a degree of purity as can only be attained at these works by a direct infringement of the company's Act, and to restrain the company from continuing the process. We make these suggestions not upon any legal advice, but on our own responsibility, as indicative of that which appears to us the promptest and most feasible remedy.

(Signed) HENRY G. SUTTON, Medical Officer.
E. WALKER, Vestry-Clerk.

Town Hall, Old Street, Oct. 17, 1876.

The MEDICAL OFFICER (Dr. Sutton) said that from the representations made to him last Monday he had not a doubt that the nuisance complained of was highly dangerous to health. It was caused by the escape of sulphuretted hydrogen, which was one of the most offensive gases that could be generated. If the nuisance had recurred on the Wednesday night, he and the clerk were prepared to make affidavits and apply to the Court of Chancery on Thursday morning.

Mr. HODGES thought the deputation would gather from what had been stated that the officers of the vestry were fully alive to the importance of taking steps to abate the alleged nuisance. He moved that the matter be referred to the Sanitary Committee to take such steps as they might deem advisable.

Mr. FELL seconded the motion, and expressed an opinion that something should be done not only to abate the nuisance but to prevent its recurrence in future, by insisting upon the process which caused the nuisance being abolished altogether. He had been informed by a gentleman, who was secretary to one of the great gas companies, that the process was unnecessary, and that the means taken for remedying slight impurities in gas were worse than the evil.

The motion was then put, and carried unanimously.

HACKNEY DISTRICT BOARD OF WORKS.—At the ordinary bi-monthly meeting, on the 13th inst., Dr. Tripe reported that he had received numerous complaints respecting the noxious smells which had pervaded the south-western portions of the district, and had ascertained that they proceeded from the gas-works in Great Cambridge Street. He had noticed these smells at night, at intervals of two or three weeks, for some time past, but they had occurred during the day as well as the night since Monday last. Having been informed that Dr. Sutton, the Medical Officer of Health for Shoreditch, had visited the works, he had communicated his readiness to give him every assistance in his power to abate the nuisance for the future. He considered the complaint of so much importance that if the board would refer it to the Sanitary Committee something would probably be done, for even if they went to the Court of Chancery it was essential that the nuisance should be abated. The report was approved, and the suggestion of the medical officer agreed to.

METROPOLITAN BOARD OF WORKS.—At the meeting on Friday last, it was resolved, on the motion of Mr. Runtz—"That the Metropolitan Board of Works and the Corporation of the City of London having taken combined action in promoting recent gas legislation, it be referred to the Works and General Purposes Committee to confer with the Corporation as to the proportion of costs to be paid by the Board and Corporation respectively." A letter was read from the Vestry of Shoreditch, calling attention to a great nuisance existing in the neighbourhood of the Haggerston station of The Gaslight and Coke Company, from the use of lime to purify the gas from sulphur to the extent prescribed by the Gas Referees; and stating that in a few days probably legal steps will be taken by the vestry to restrain the Gas Referees from prescribing such a degree of purity from sulphur as can only be attained at the cost of a great nuisance to the neighbourhood in which the works are situated, and that the Board may be asked to appear or to give the assistance of its consulting chemist in the matter. On the motion of Mr. Fell, the communication was referred to the Works Committee for consideration and report.

METROPOLIS WATER SUPPLY.

Major Bolton reports that the water in the river Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was good on 22 days, and slightly coloured during the other days of the month of September. The highest flood state of the river was 9 inches above the (6 feet) summer level, and the lowest was 4 inches below summer level. The highest temperature of the water taken at Seething Wells was 62°, and the lowest 52°, while the highest temperature of the air at the same place was 68°, and the lowest 50°. The condition of the water in the river was good on 27 days, and indifferent on 3 days, when it was slightly stained. These observations were made daily at 9 a.m. The rainfall for the month was 2·39 inches.

EAST BRENT WATER SUPPLY.—The water-works of Archdeacon Denison, which, throughout the past summer, have proved such a boon to the parishioners, are now being greatly extended and improved by the widening and deepening of the upper reservoir. The work already completed has been done at the cost of some £117, in addition to the expense of carrying the water through a filtering-bed from the reservoir 200 yards on its way to the village. This amount was defrayed by the archdeacon himself.

THE GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting of the Shareholders of this Company was held at the Offices, Horseferry Road, Westminster, on Friday last, the 20th inst.—the Hon. RICHARD HOWE BROWNE (the Governor) presiding—to authorize the raising of the sum of £125,000, by the creation and issue of debenture stock, under the powers of the company's Act, 1872.

The SECRETARY (Mr. J. O. Phillips) having read the notice convening the meeting,

The GOVERNOR said: Ladies and gentlemen, the object of the present meeting is explained to you in the notice just read. We require an additional amount of capital to carry on our works, and we propose, under the provisions of the Act of 1872, to raise the necessary sum by the creation of debenture stock. The amount will be £125,000, and it will be, in the first instance, offered to the proprietors of the company at par. When I last addressed you, I told you that a very large concern, like that of which we have the management, would require, from time to time, additional sums of money to enable us to carry on its business. At the present moment we have under contract very large works, for the payment of which we must provide. We have just made a call of £2 upon the proprietors of the fourth issue of guaranteed stock, and it will be necessary in the course of next year, but not, I hope, before Midsummer, to make two further calls upon that stock, the whole of the money upon which will then have been paid. That stock, as you are aware, will come into the receipt of full dividends in the year 1880. I think I have no further remark to make, except that I may mention the board have determined to issue this debenture stock at the rate of 4 per cent. per annum. We think we are justified in offering it at that low rate of interest, because we have assured ourselves that we shall be able to float it at that price. We believe that in the future the raising of very large sums of money, which by-and-by we shall have to raise by the creation of debenture stock, will be ruled in a great measure by the rate at which we are at present enabled to issue the amount now asked for. I may mention that several of the railway stocks in this country have been raised at the rate of 4 per cent. per annum, and those stocks are invariably quoted in the market at a considerable premium, varying from 4 to 6, and even 6¼ per cent. That is a tolerably good premium, and I hope—in fact, I am sure—that we shall get a quotation for our debenture stock upon the Stock Exchange, which will considerably enhance its value when issued. I may also remark that we are actuated, in naming this low rate of interest, by the fact that, during the next four or five years—*i. e.*, up to 1880—we shall have to renew a very large amount of debentures, which are now outstanding, at a higher rate of interest, and by substituting for them this debenture stock, we shall secure a very great saving to the company. I calculate that, at the end of the period I have named, we shall have floated a million and a half of debenture stock at a very low rate of interest, which, of course, will be a great advantage to the company. There are certain debentures which we have not the power of reducing, or calling in; but the greater proportion of those that are outstanding we have the power in ourselves of offering, as we did the other day, to renew at 4 per cent. It was but a small amount—something like £13,000 or £14,000—and I may state that we had offers from several parties to take the whole amount off our hands at once. I may also further state that, as late as this morning, I have received a communication from one of our largest proprietors to say that he and his friends will take the whole amount of stock we now propose to issue. There is one thing I may mention, although it is not exactly relevant to the business of the day, but I dare say you have seen the announcement in the papers, that we are enabled to give notice of a reduction in the price of gas all over our district, which comprehends three-fourths of London, from the 1st of January next, of 3d. per 1000 cubic feet, making the price after that time 3s. 6d. This reduction, of course, will give great satisfaction to the consumers, and for my brother directors and myself I may say, that we feel quite confident that it will be for the advantage of the company. I now beg to move—"That the directors be, and they are hereby authorized to raise, by the creation and issue of debenture stock, the sum of £125,000, under the powers of the company's Act of 1872, at such period, upon such terms, and under such conditions and provisions as the directors shall determine."

Mr. E. VAUGHAN RICHARDS seconded the motion.

Mr. SAYWELL thought that further information should have been given to the proprietors before being called on to vote, and that the terms upon which the stock would be issued should have been stated in the notice convening the meeting.

Sir ANDREW SCOTT WAUGH said he was sure every one present felt the utmost confidence in the board, who, no doubt, were acting most judiciously in this matter; but he wished to know why the directors did not call up the amount due on the shares before borrowing money.

The GOVERNOR said the mode of raising money was regulated by clauses in the company's Act of Parliament. It was provided that when a certain amount of share capital was subscribed they must raise so much by debentures before making further calls.

Sir A. SCOTT WAUGH said he supposed the new shares would be called up.

The GOVERNOR said they would be in time.

After some remarks by a PROPRIETOR, who concurred in the motion, and expressed a hope that it would be carried without a dissentient,

The resolution was put and carried unanimously, and the proceedings terminated.

NEWCASTLE AND GATESHEAD WATER COMPANY.—An extraordinary general meeting of shareholders was held on Tuesday, Oct. 17—Alderman Plummer in the chair—"for the purpose of considering, and, if so approved, of sanctioning the raising of additional capital for the construction of certain of the works authorized by the Newcastle and Gateshead Water-Works Act, 1876." The secretary (Mr. Main) having read the notice of meeting, the chairman moved—"That the directors be, and they are hereby empowered to issue £120,000 of the capital authorized by the Act of 1876, by the creation of £5 shares having a preferential dividend of 5 per cent. per annum guaranteed thereon, with the option on the part of the holders to convert them into ordinary stock within a year after the last call is made; that such shares be divided among the shareholders at par, and that any fractional or unappropriated shares be sold for the benefit of the company, and that the directors be authorized to exercise the borrowing powers conferred by the said Act, when they shall deem it prudent for the interests of the company to do so—£40,000 in a few months, £1 per share at first, and after as required." It was more than possible, he said, that they might require money to the extent of £40,000 in a few months, but not more than £1 per share would be called up at first, and the remaining amount would be afterwards called up as it was required, and of which the shareholders would receive notice. Mr. Potter, in seconding the motion, stated that the reason for making the call larger, perhaps than some of the shareholders might deem advisable, was that the directors would be enabled, as soon as it was paid, to borrow £30,000. They had already the engine at Wylam, and the laying of the pipes for the separation of the water for manufactories from the water for domestic purposes was proceeding. This separation would cost something like £40,000, which sum would be required in the course of nine or ten months, so that he should say that little more than £2 a share would be required—at any rate for seven or eight months. The chairman said the directors had in view that there would be two kinds of ordinary stock, upon one of which ten per cent. would be paid, and upon the other seven. The resolution was put to the meeting, and carried unanimously.

MANCHESTER CORPORATION GAS-WORKS.

In the JOURNAL of the 12th ult., page 380, we gave an abstract of the Report of the Gas Committee for the Year ending June 24, 1876. The following are the accounts for that period:—

PROFIT AND LOSS ACCOUNT.

EXPENDITURE.

To Cannel			£177,493 18 5
Retort men's wages			28,746 13 9
Retorts, materials, and setting			7,044 17 3
Purifying charges			4,246 0 7
Labourers wages, and repairs, &c., of works—			
Gaythorn station	£9,438 10 0		
Rochdale Road station	7,569 10 1		
Street-mains	6,072 16 11		
Droylsden works	243 7 10		
Repairs of hired meters	575 10 0		
		23,899 14 10	
Salaries			10,419 5 5
Collectors poundage, &c.			5,186 9 3
Chief and other rents, rates, and taxes, &c.—			
Chief rents	£635 1 9		
Rates and rent of offices	92 4 4		
Rates on stations and street-mains	6,591 17 11		
		7,319 4 0	
Income-tax			897 13 3
Amount transferred to capital account for depreciation of works—			
Gaythorn station—			
4 p. ct. on buildings (£68,103 12s. 2d.)	£2,724 2 10		
5 p. ct. on apparatus (£44,197 5s. 2d.)	2,209 17 3		
	£4,934 0 1		
Rochdale Road station—			
4 p. ct. on buildings (£116,362 13s. 8d.)	£4,654 10 2		
5 p. ct. on apparatus (£74,345 11s. 4d)	3,717 5 7		
	8,371 15 9		
Droylsden works—			
4 p. ct. on buildings (£8260 1s. 4d.)	£250 8 1		
5 p. ct. on apparatus (£6419 14s. 7d.)	320 19 9		
	571 7 10		
Street-mains store (Poland St.)—			
4 p. ct. on buildings (£1486 9s. 10d.)	£39 9 2		
5 p. ct. on apparatus (£364 8s. 1d.)	18 4 5		
	77 13 7		
Street-mains—			
2½ per cent. on main-pipes (£226,949 11s. 10d.)	5,673 14 10		
Hired meters and fittings—			
10 per cent. on £38,574 0s. 3d.	3,857 8 0		
Meter-proving apparatus—			
10 per cent. on £57 14s. 1d.	5 15 6		
		23,491 15 7	
Stationery and advertising			705 10 8
Law stationery, receipt, postage, and deed stamps, &c.			262 12 10
Clothing for inspectors, &c.			102 10 6
Subscriptions to Infirmary, Eye Hospital, &c.			59 10 0
Miscellaneous expenses			1,075 13 1
Bad debts			839 10 10
Balance carried down			101,232 4 6
			£393,021 4 9
Interest on loans, &c. (less income-tax)			£16,185 10 8
Amount transferred to capital account, towards liquidation of mortgage debt			28,070 2 5
Surplus payable to the Improvement Department			39,410 17 0
Amount retained towards repayment of advances made to the Improvement Committee in anticipation of profits			17,565 14 5
			£101,232 4 6

RECEIPTS.

By Gas-rental—			
Within the city—			
Private consumers	£234,847 11 5		
Meter-rents	3,247 15 0		
Public lamps	13,812 1 0		
	£251,907 7 5		
Beyond the city—			
Private consumers	£75,206 8 0		
Meter-rents	1,291 6 7		
Public lamps	5,925 1 3		
	82,422 15 10		
		£334,330 3 3	
Coke			24,556 13 4
Tar	£20,656 13 1		
Ammonia water	13,477 15 1		
		34,134 8 2	
		£393,021 4 9	
Balance brought down, being the gross profit on the year's working			£101,232 4 6

GENERAL SUMMARY OF RECEIPTS AND EXPENDITURE ON CAPITAL AND REVENUE ACCOUNT.

RECEIPTS.

To Balance in the bank, June 24, 1875	£61,475 2 6		
Ditto in the treasurer's hands, June 24, 1875	422 17 3		
Ditto of sums owing to and by the committee, including stocks on hand, June 24, 1875	77 387 14 2		
		£139,285 13 11	
Balance of profit and loss account, as per statement			56,976 11 5
Loans received			150 6 1
Materials sold (capital account) as per statement—			
Gaythorn station	£122 18 9		
Rochdale Road station	204 11 7		
Droylsden station	47 8 0		
		374 18 4	
Amount transferred from revenue account—			
For depreciation of works		23,491 15 7	
Liquidation of mortgage debt		28,070 2 5	
		£248,349 7 9	

EXPENDITURE.

By Loans repaid			£26,957 14 0
Improvement and Chorlton-upon-Medlock Committees—			
Surplus for the year ending June 24, 1875	£61,109 9 10		
Less retained on account of amount advanced in anticipation of profits	25,852 7 9		
		35,257 2 1	
Expenditure on capital account, viz.—			
Gaythorn station	£111 8 1		
Rochdale Road station	12,980 6 10		
Droylsden works	4 10 8		
Bradford Road works	4,532 0 0		
Street-mains	6,647 6 4		
Service-pipes (one moiety)	1,532 4 8		
Ditto, transferred from Droylsden station	40 3 0		
Hired meters, &c.	9,205 4 7		
		35,053 4 2	
Balance in the bank, June 24, 1876	£83,942 10 11		
Ditto in the treasurer's hands, June 24, 1876	522 2 9		
		84,464 13 8	
Ditto of sums owing to and by the committee, including stocks on hand, June 24, 1876		66,616 13 10	
		£248,349 7 9	

STATEMENT OF ASSETS AND LIABILITIES.

PERMANENT ASSETS.

Gaythorn station—			
Land, buildings, and apparatus, as per last report	£172,768 14 2		
Less—			
Yard mains delivered to streets department	£122 18 9		
Depreciation	4,934 0 1		
	5,056 18 10		
		£167,711 15 4	
One year's outlay to June 24, 1876—			
Lattice Bridge	£15 14 1		
Alteration, No. 1 purifying-shed	88 8 3		
Cannel stores roof	7 5 9		
	111 8 1		
		£167,823 3 5	
Rochdale Road station—			
Land, buildings, and apparatus, as per last report	£222,513 9 10		
Less—			
Yard mains delivered to streets department	£204 11 7		
Depreciation	8,571 15 9		
	8 576 7 4		
		£213,937 2	
One year's outlay to June 24, 1876—			
Cannel stores	£2,406 5 7		
No. 1 retort-house	972 7 10		
,, 3 ,,	346 8 1		
,, 4 ,,	545 11 0		
Office furniture	2 17 6		
Coolers	682 9 7		
Hydraulic apparatus	5,225 14 2		
Sectional boiler and locomotive engine	1,773 4 10		
Station-meter	1,025 8 3		
	12,980 6 10		
		226,917 9	
Droylsden station—			
Land, buildings, and apparatus, as per last report	£13,503 13 2		
Less—			
Materials sold	£47 8 0		
Depreciation	571 7 10		
	618 15 10		
		£13,889 17 4	
One year's outlay to June 24, 1876—			
Governor and pipes	4 10 8		
		13,894 8 0	
Bradford Road station—			
Land, as per last report		£30,443 9 9	
One year's outlay to June 24, 1876—			
River wall	£3067 3 8		
Brick-making	390 10 6		
Miscellaneous expenses	174 5 10		
	4,532 0 0		
		34,975 9 9	
Street-mains store (Poland Street)—			
Land, buildings, and apparatus, as per last report	£3,256 17 11		
Less depreciation	77 13 7		
		3,179 4 4	
Street-mains—			
Main-pipes, as per last report	£224,354 2 8		
Ditto transferred from Droylsden station	2,595 9 2		
	£226,949 11 10		
Less depreciation	5,673 14 10		
	£221,275 17 0		
One year's outlay to June 24, 1876	6,647 6 4		
		227,923 3 4	
Service-pipes—			
Service-pipes laid, as per last report	£22,680 19 1		
Ditto transferred from Droylsden station	620 4 5		
	£23,301 3 6		
Moiety of one year's outlay, charged to capital account	£1,532 4 8		
Transferred from Droylsden and charged to capital account	40 3 0		
	1,572 7 8		
		24,873 11 2	
Hired meters, &c.—			
Outlay, as per last report	£38,421 4 1		
Transferred from Droylsden station	152 16 2		
	£38,574 0 3		
Less depreciation	3,857 8 0		
	£34,716 12 3		
One year's outlay to June 24, 1876	9,205 4 7		
		43,921 16 10	
Meter-proving apparatus—			
Outlay, as per last report	£57 14 1		
Less depreciation	5 15 6		
		51 18 7	
		£742,560 4 9	

FLOATING ASSETS.

Cannel, retorts, and other materials on hand	£53,509 10 9		
Gas-rents, and sundry accounts due to the committee	67,982 17 11		
Amount paid in advance to the Improvement Committee, in anticipation of profits	26,457 10 3		
Balance in the bank	83,942 10 11		
Ditto in the treasurer's hands	522 2 9		
		232,414 12 7	
		£974,974 17 4	
Excess of assets, June 24, 1876		£455,869 17 0	
Ditto of assets, June 24, 1875		427,799 14 7	
Increase, being the amount charged upon the profit for the present year towards liquidation of mortgage debt, and carried to capital account		£28,070 2 5	

LIABILITIES.

Amount secured by mortgage		£400,215 13 11	
Sums advanced, not secured by mortgage		5,287 0 2	
			£405,502 14 1
Purchase of land, the purchase-money being left in the hands of the committee, at interest			1,750 0 0
Sundry accounts owing			38,566 1 11
Deposits in hand			16,279 12 11
			£462,198 8 11
Surplus for the year ending June 24, 1876, payable to the Improvement Department	£39,410 17 0		
Retained towards repayment of advances made to the Improvement Department, in anticipation of profits	17,565 14 5		
		56,976 11 5	
Balance, being excess of assets		455,869 17 0	
		£974,974 17 4	

[APPENDIX A.]

Statement of the Lamp and Private Rental (including Meter-Rents) derived from the Townships within and beyond the City respectively, for the Years 1874-75 and 1875-76.

	Half Year ending Dec. 25, 1874.	Half Year ending June 24, 1875.	Total for the Year 1874-5.	Half Year ending Dec. 25, 1875.	Half Year ending June 24, 1876.	Total for the Year 1875-76
Within the city—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Township of Manchester—						
Private rental	70152 13 7	74275 3 1		72191 5 7	73628 4 7	
Public lamps	3410 17 3	3086 4 9		3461 8 10	3674 13 10	
	73563 10 10	77361 7 10		75652 14 5	77302 18 5	
Other townships—						
Private rental	44170 19 5	46290 12 2		45950 13 4	46325 2 11	
Public lamps	3232 10 4	3270 3 10		3317 8 7	3358 9 9	
	47403 9 9	49560 16 0		49268 1 11	49683 12 8	
Total within the city	120967 0 7	126922 3 10	247889 4 5	124920 16 4	126986 11 1	251907 7 5
Beyond the city—						
Private rental	36813 0 3	36134 16 11		38259 1 5	38238 13 2	
Public lamps	2454 19 4	2814 2 9		2903 1 2	3022 0 1	
Total beyond the city	39267 19 7	38948 19 8	78216 19 3	41162 2 7	41260 13 3	82422 15 10
Gross rental	160235 0 2	165871 3 6	326106 3 8	166082 18 11	168247 4 4	334330 3 3

Within the city: Gross rental (1874-75) £247,889 4s. 5d.; ditto (1875-76) £251,907 7s. 5d.; increase, £4,018 3s. 0d. Beyond the city: Gross rental (1874-75) £78,216 19s. 3d.; ditto (1875-76) £82,422 15s. 10d.; increase £4,205 16s. 7d. Total: Gross rental (1874-75) £326,106 3s. 8d.; ditto (1875-76) £334,330 3s. 3d.; increase, £8,223 19s. 7d.

[APPENDIX B.]

Comparative Statement of the Quantity of Gas transmitted from the Works, in the Day-time and during the Twenty-four Hours, for the Years 1874-75 and 1875-76.

	Day-time.				Twenty-four Hours.			
	1874-75.	1875-76.	Increase.	Decrease.	1874-75.	1875-76.	Increase.	Decrease.
	Cubic Feet.	Cubic Feet.	Per cent.	Per cent.	Cubic Feet.	Cubic Feet.	Per cent.	Per cent.
July	15,737,000	22,564,000	43·19	....	69,640,000	82,627,700	18·65	....
August	16,710,000	22,452,900	34·36	....	87,091,000	97,407,900	11·84	....
September	20,619,000	23,472,400	13·83	....	119,862,000	123,217,000	2·79	....
October	30,152,000	34,836,500	15·53	....	182,140,000	181,908,800	....	0·12
November	35,913,000	43,016,000	19·77	....	225,069,000	232,695,800	3·38	....
December	59,169,000	53,926,600	....	8·86	275,430,000	281,128,600	2·06	....
January	43,331,000	51,829,300	19·61	....	241,998,000	265,866,000	9·86	....
February	40,182,000	42,494,500	5·75	....	203,324,000	218,964,400	7·69	....
March	38,960,000	38,404,900	....	1·42	178,665,000	180,604,400	1·08	....
April	29,650,000	28,164,100	....	5·01	125,682,000	124,795,400	....	0·70
May	23,169,000	25,893,000	11·75	....	93,858,000	104,192,000	11·01	....
June	21,125,000	21,194,800	0·33	....	75,632,000	79,288,000	4·83	....
Total	374,737,000	408,249,000	8·94	....	1,878,391,000	1,972,696,000	5·02	....

During the day-time (1874-75) 374,737,000 cubic feet; (1875-76) 408,249,000 cubic feet; increase, 33,512,000 cubic feet. During the twenty-four hours (1874-75) 1,878,391,000 cubic feet; (1875-76) 1,972,696,000 cubic feet; increase, 94,305,000 cubic feet.

[APPENDIX C.]

Table showing the Number of each Size of Meters in use on June 24, 1875 and 1876, respectively.

Size of Meters.	Townships within the City.														Townships beyond the City.		Total.		Increase.	Decrease
	Manchester.		Chorlton-on-Medlock.		Hulme.		Ardwick.		Beswick.		Cheetham.		Total within the City.							
	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.		
1 light	35	26	13	9	10	7	7	6	..	..	..	1	65	49	23	19	88	68	..	20
2 lights	11050	10986	3649	3685	6614	6597	2564	2589	461	495	1522	1496	25860	25848	9507	9610	35367	35458	91	..
3 "	3934	3974	2588	2632	2299	2372	761	780	105	118	1276	1339	10963	11215	4027	4695	14990	15910	920	..
5 "	2686	2691	1711	1798	762	784	351	379	41	47	924	939	6475	6638	2993	3241	9468	9879	411	..
10 "	1624	1711	520	562	233	249	131	139	12	12	275	289	2795	2962	1109	1206	3904	4168	264	..
15 "	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	1	..
20 "	958	993	145	171	96	106	52	53	2	3	69	68	1322	1394	370	416	1692	1810	118	..
30 "	407	431	39	56	31	38	11	13	3	3	29	29	520	570	131	134	651	704	53	..
45 "	38	35	4	3	2	2	2	2	..	..	..	..	46	42	9	9	55	51	..	4
50 "	279	300	20	24	15	17	11	15	2	2	16	18	343	376	69	82	412	458	46	..
60 "	120	125	9	8	16	15	2	2	..	..	8	9	155	159	16	23	171	182	11	..
80 "	98	102	9	8	9	11	5	4	..	..	1	1	122	126	19	18	141	144	3	..
100 "	151	165	11	10	9	7	4	6	1	1	9	7	185	196	39	47	224	243	19	..
150 "	48	55	6	6	7	7	4	5	..	..	2	2	67	75	14	14	81	89	8	..
200 "	23	18	4	4	3	3	2	2	..	..	3	3	35	30	14	14	49	44	..	5
250 "	3	5	..	..	..	..	..	..	1	1	..	..	4	6	1	..	5	6	1	..
300 "	16	17	4	4	2	3	..	..	..	..	3	3	25	27	14	15	39	42	3	..
500 "	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1	..	..
600 "	3	3	..	..	..	..	..	..	..	..	..	..	3	3	..	..	3	3	..	..
1000 "	1	1	..	..	..	..	..	..	..	..	..	..	1	1	1	1	2	2	..	..
Total	21474	21639	8732	8980	10168	10218	3907	3995	628	682	4137	4204	48986	49718	18357	19545	67343	69263	1949	29

Total increase, 1949. Deduct decrease, 29; net increase, 1920 meters.

Statement showing the Number and Size of Meters on Hire on June 24, 1876 (included in the above Table).

	1 Light.	2 Lights.	3 Lights.	5 Lights.	10 Lights.	20 Lights.	30 Lights.	50 Lights.	60 Lights.	80 Lights.	100 Lights.	150 Lights.	Total, 1875.	Total, 1876.	Increase. 1876.
Within the city	48	14152	5794	2757	748	195	45	33	13	8	12	..	21704	23805	2101
Beyond the city	9	3366	2628	1517	272	54	9	6	5	1	6	..	6606	7813	1207
Total	57	17458	8422	4274	1020	249	54	39	18	9	18	..	28310	31618	3308

[APPENDIX D.]

Gas-Mains Laid and Taken Up during the Year ending June 24, 1876.

Laid.	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 8 in.	Diam. 9 in.	Diam. 12 in.	Diam. 14 in.	Total Length.	Remarks.
Townships within the city—	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	
Manchester	2638	755	579	8	271	342	..	12	9	4614	
Chorlton-upon-Medlock	1794	..	..	..	..	..	..	..	..	1794	
Hulme	596	110	9	..	..	..	..	372	..	1087	
Cheetham	312	97	..	..	..	..	..	..	..	409	
Ardwick	937	89	..	..	108	..	..	..	..	1134	
Beswick	898	350	..	..	..	..	..	..	..	1248	Yards laid—
Townships beyond the city	7175	1401	588	8	379	342	..	384	9	10286	Within the city.
	7780	4973	2106	..	715	710	185	123	..	16592	Beyond the city.
Total	14955	6374	2694	8	1094	1052	185	507	9	26878	During the year.
	Being 15¼ miles and 38 yards.										
Taken up.											Yards taken up—
Townships within the city	1078	1240	55	18	379	..	..	..	..	2779	Within the city.
Townships beyond the city	46	759	65	27	98	21	..	..	..	1016	Beyond the city.
Total	1124	2008	120	45	477	21	..	..	..	3795	During the year.
	Being 2 miles and 275 yards.										
Laid during year 1875-76	14955	6374	2694	8	1094	1052	185	507	9	26878	
Taken up during year 1875-76	1124	2008	120	45	477	21	..	..	..	3795	

Net increase during the year ending June 24, 1876 . . . . . 23,083 yards. Total net increase during the year . . . . . 13 miles and 203 yards.

[APPENDIX D—*continued.*]

Summary.

	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 7 in.	Diam. 8 in.	Diam. 9 in.	Diam. 10 in.	Diam. 11 in.	Diam. 12 in.	Diam. 13 in.	Diam. 14 in.	Diam. 15 in.	Diam. 16 in.	Diam. 17 in.	Diam. 18 in.	Diam. 20 in.	Diam. 22 in.	Diam. 24 in.	Diam. 30 in.	Total Length
Pipes laid to June 24, 1875—	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.
Within the city . . .	249987	123311	50443	14863	31333	738	14885	13496	1456	279	29215	309	7213	4978	3993	55	5811	324	477	6799	2520	562485
Beyond the city . . .	135349	57470	52300	6621	30821	410	25014	13517	1327	1808	20270	..	749	305	..	..	4031	..	..	315	..	350307
Pipes laid during the year ending June 24, 1876—	385336	180781	102743	21484	62154	1148	39899	27013	2783	2087	49485	309	7962	5283	3993	55	9842	324	477	7114	2520	912792
Within the city . . .	7175	1401	588	8	379	..	342	..	..	..	384	..	9	..	..	..	..	..	..	..	..	10286
Beyond the city . . .	7845	4973	2129	..	715	..	710	185	..	..	123	..	..	..	..	..	..	..	..	..	..	16680
	400356	187155	105460	21492	63248	1148	40951	27198	2783	2087	49992	309	7971	5283	3993	55	9842	324	477	7114	2520	939758
Deduct pipes taken up during the year	1124	2008	120	45	477	..	21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3795
Total	399232	185147	105340	21447	62771	1148	40930	27198	2783	2087	49992	309	7971	5283	3993	55	9842	324	477	7114	2520	935963*

* Total, 935,963 yards or 531¾ miles and 83 yards.

[APPENDIX E.]

Statement showing the Amount of Gross Profit, and the Mode of its Appropriation; also the Amount of Borrowed Money Owing, and the Excess of Assets, &c., from the Year 1862 to the present Date.

Year ending June 24.	Profits.	Maximum Price of Gas, per 1000 Feet, within the City.	Appropriation of Gross Profits.			Amount advanced to Improvmnt. Committee in anticipation of Profits.	Paid over for Improvement Purposes.	Retained toward Repayment of Advances made to the Improvement Committee in anticipation of Profits.	Balance owing of Amounts advanced in anticipation of Profits.	Borrowed Money Owing.	Amount charged to Revenue in respect of Depreciation of Works and Mains.	Excess of Assets.
			Interest.	Liquidation of Mortgage Debt.	Surplus.							
	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1862 .	42667 7 1	. . . . . 4 0	15482 3 2	19330 14 4	7854 9 7	....	7854 9 7	....	....	382530 7 10	12179 4 11	126591 4 6
1863 .	55804 12 9	Half year . 4 0 ,, . 3 9	14932 17 8	18609 17 4	22261 17 9	....	22261 17 9	....	....	362877 8 10	12666 18 11	145201 1 10
1864 .	59545 18 9	Half year . 3 9 ,, . 3 6	13388 12 10	17810 1 0	27847 4 11	....	27847 4 11	....	....	355808 16 9	12690 12 9	163011 2 10
1865 .	56432 4 5	Half year . 3 6 ,, . 3 2	13086 10 9	17587 0 11	25758 12 9	....	25758 12 9	....	....	306951 2 2	13050 6 6	180598 3 9
1866 .	52553 2 10	. . . . . 3 2	13252 13 0	19784 2 0	19516 7 10	....	19516 7 10	....	....	347472 2 11	13817 2 9	200382 5 9
1867 .	47323 0 4	. . . . . 3 2	14167 11 7	19898 0 4	13257 8 5	....	13257 8 5	....	....	331725 9 7	14628 8 6	220280 6 1
1868 .	49546 4 7	. . . . . 3 2	14314 17 9	20246 0 5	14985 6 5	13059 8 5	28044 14 10	....	....	351035 10 4	15173 2 5	239085 15 6
1869 .	52736 18 4	. . . . . 3 2	15467 12 6	22688 14 4	14580 11 6	11303 19 8	25884 11 2	....	24363 8 1	365460 8 5	15387 15 7	262374 9 10
1870 .	65343 10 8	. . . . . 3 2	16784 13 8	24487 6 0	24071 11 0	3750 0 0	27821 11 0	....	28113 8 1	432941 1 9	17693 5 10	286861 15 10
1871 .	79322 9 5	. . . . . 3 2	18329 0 5	27050 15 11	33942 13 1	....	28020 11 11	5922 1 2	22191 6 11	448593 9 5	19002 10 5	313912 11 9
1872 .	63257 9 7	. . . . . 3 2	18539 19 6	27805 15 11	16911 14 2	13293 10 3	30205 4 5	....	35484 17 2	459593 9 5	22283 6 8	341718 7 8
1873 .	63003 0 6	One Qr. . 3 2 Three ,, . 3 4	18413 7 1	28588 19 6	16000 13 11	16641 11 6	33242 5 5	....	52126 8 8	460640 11 0	22614 18 6	370307 7 2
1874 .	77465 12 2	Half Year . 3 4 ,, . 3 8	18861 13 3	28977 9 6	29626 9 5	183 9 4	29809 18 9	....	52309 18 0	457834 5 0	22849 4 5	399284 16 8
1875 .	106807 6 5	. . . . . 3 8	17182 18 8	28514 17 11	61109 9 10	....	35257 2 1	23852 7 9	26457 10 3	432310 2 0	22908 7 0	427799 14 7
1876 .	101232 4 6	Half Year . 3 8 ,, . 3 6	16185 10 8	28070 2 5	56976 11 5	....	39410 17 0	17565 14 5	8891 15 10	4055C2 14 1	23491 13 7	455869 17 0
Total.	873641 2 4	....	238890 2 6	349449 17 10	385301 2 0	....	394192 17 10	....	....	....	260977 0 9	...

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

The Ninth Half-Yearly Meeting of the West of Scotland Association of Gas Managers was held in the Andersonian University, George Street, Glasgow, on Thursday, Sept. 28, at 10.30 a.m.—Mr. LEVI MONK (Lanark), President of the Association, in the chair.

ADMISSION OF NEW MEMBERS.

The following gentlemen were admitted members of the Association:—Messrs. Gavin M'Ghie, Lochwinnoch; Richard Wyllie, Johnstone; David Black, Falkirk; William Galbraith, Ardrossan; John Hutchison, Wicklow; and John Massey, Woodside, Aberdeen. The following gentlemen were admitted extraordinary members of the Association:—Messrs. John Hurll, Fire-Clay Brick-Works, Glenboig, Coatbridge, and A. C. M'Laughlin, Port Dundas Road, Glasgow.

MINUTES.

Mr. W. M'GILCHRIST, secretary of the Association, read the minutes of the last meeting, as also the minutes of various committee meetings, which, on the motion of the PRESIDENT, seconded by Mr. FAIRWEATHER (Barrhead), were unanimously adopted.

PRESIDENT'S ADDRESS.

The PRESIDENT then said:

Gentlemen,—First, I have to thank you sincerely for the honour you have conferred upon me by electing me your president. If my own wishes had been consulted, I should have preferred retiring from the committee to the position of an ordinary member, knowing full well my inability and want of time to serve you as I would wish; but as you have decided otherwise, your good opinion is highly esteemed, and I will endeavour to serve you to the best of my ability. It is almost needless for me to remind you that one in my position, having all the collection, beside all the other duties of general management of small works, has not much leisure time for preparing addresses such as you should receive at this half-yearly meeting; therefore you will excuse me if my address also takes somewhat the form of a paper.

With the aid of the committee, who work so cordially with me, we shall endeavour to merit your esteem, and work for the best interests of the Association. We crave your indulgence of our imperfections, and ask you to assist us to the best of your ability. I may here remark that we have not the response we anticipated to our circulars giving the list of subjects, and asking for papers. It cannot be expected that Mr. Young, Mr. Dunlop, or myself, will intrude upon your time with our opinions to any extent, by papers, for some time now; and as no circulars will be sent out again for some time, asking for papers, and suggesting a list of subjects, we trust many of you have taken up subjects, and will prepare papers for future meetings.

As it is customary to refer to events that have occurred since we last met, I will do so to some extent. First, then, I should refer to the meetings of associations that have intervened, and say that the value of these association meetings, to all concerned, is very much more than we are aware of by superficial observation. As an instance of the force of my remark, I have brought with me a number of "Reports of Proceedings of Associations," and other papers, which you will find on the table before you. These are the outcome of the meetings. To show their value, and how much appreciated these "Reports" are, some time ago I advertised for those you notice are missing—viz., from 1862—but not a reply did I receive; and I understand the secretary of the North British Association has been unable to retain his own copy of the North British proceedings prior to 1869. It may not be out of place to mention that for the first few years their extreme modesty kept them from publishing, in a pamphlet form, their proceedings, so that the record in the JOURNAL OF GAS LIGHTING is the only place to find anything about their doings for the first four or five years.

A very pleasant feature of these associations, too, is the kindly, frank, and courteous welcome and intercourse when gas managers meet; and courteous replies to inquiries on any subject anent business or associations. And it is perfectly astounding, when we consider the information that is conveyed suitable for every position and requirement of gas managers in all parts of the world, and remember the reserve that existed prior to 1861. And we should not lose sight of the incalculable advantage they must have been to gas consumers and companies in particular, for it is for their benefit all our aims are directed. Rule-of-thumb work, apathy, and indifference have all to give way before the gradually advancing wave of scientific research; and new ideas have no chance of success, unless backed up by proof of what is contended for them. Hence, at association meetings, many objections are discussed that entirely ventilate them, and prove whether they are worth consideration or not. In this way many thousands of pounds are saved, and a vast amount of labour, which would otherwise go for nothing. The facility, too, we have of deciding what is right and wrong, before proceeding to make alterations or extensions—compared with the knowledge of 20 or 25 years ago—is amazing; and no man is justified in proceeding upon any alteration he may have to make unless he has studied and decided the right and proper reconstruction. The company I represent have wasted very much time and money, comparatively speaking, for want of having done so. Time does not permit me to enumerate the causes, most of which, I am sorry to say, have to be remedied before we get the full advantage of manufacturing and selling gas with economy. If a gas manager has not the opportunity or ability, he should consult some master mind on the subject, being careful the handle to a name does not mislead him, but to know, by his reputation, his ability. In my opinion, there is too much dabbling in engineering, and all renewals and alterations are not so creditable as they should be. One man dips his gas into a (very imperfect form of) cold washer or scrubber as it leaves the hydraulic main; another has neither washer nor scrubber; another puts his washer after his purifiers, with results of which most of you are aware; another alters his works with such foolish economy, and in such an imperfect manner, that when he has finished all needs being reconstructed; another goes to the opposite extreme, and, instead of looking ten years ahead, goes fifty, or remodels his works at such an expense, and of such a size, that most probably much of the capital and labour expended will never be brought into remunerative action. With the advanced knowledge of the science of gas lighting in the present day, these inconsistencies should not be; but the fact is, there is too much playing at gas management. Directors of companies and corporation committees should see that they get a gas manager when they want one, and not one who has to serve his apprenticeship, at the expense of consumers and shareholders. Superiors, also, should abstain from dabbling in management themselves, unless they devote much time to thoroughly understand the business. The pay of one half of our gas managers is not sufficient to induce them to undergo that thorough training which is necessary in order to gain the ability to enter the profession that its duties require of them. For the reasons I have mentioned, a vast amount of money is being wasted upon the erection of works, the manufacture, distribution, and consumption of coal gas, as well as the utilization of residual products, that might otherwise, to a great extent, be saved. How much better it is to see a work in the best position for it. If it is in a bad position and condition, at once remove it to a more suitable one, and reconstruct it on the most modern prin-

ciples and plans, for the economy of force, labour, and money, in every way, to consumers and shareholders, and so as to be most advantageous for manufacture and distribution. The more I consider it, the more I wonder (with all deference to associations) the British Association for the Advancement of Science should not institute a "special gas section." I note with admiration that they have granted a small sum for more fully investigating and reporting upon the best methods of developing the illuminating power in the combustion of coal gas of various qualities, and that they have appointed a committee for that purpose. (See JOURNAL, Sept. 19, p. 408.)

I may mention that when I received the circular of the parent society (from Mr. Adamson, secretary, now of the Airdrie Iron Company) in March, 1862, with the resolution come to at the preliminary meeting in August, 1861, and an intimation of the first meeting in Edinburgh, in April, 1862, little did I think what fruit that meeting would bear. It is needless, however, for me to refer to it further here. In my presumption at that time I tossed it aside, having seen several new works erected so complete with all requirements, improvements, and correct order of apparatus for manufacture and distribution, as far as known, up to 1861, and seeing so few in the West of Scotland I could form the same opinion of, thinking, if I got no better information, or saw better specimens of works, I would, as I afterwards did, strike out south for information, and to many foreign works too. But now there is no necessity for such a mistaken course. The various publications, notably Clegg's "Treatise," fifth edition, 1868, the "Reports of Associations," before you, and the JOURNAL OF GAS LIGHTING, which keeps us posted up with everything important from all parts of the world so much better; and, above all, the meetings of associations should guide every one in the right course. The student of gas management has, therefore, now no excuse whatever—he has immense advantages over his predecessor of 20 years ago—unless it be want of time, and overwork, preventing him from availing himself of them, and this is too frequently the case. The different qualifications of a gas manager have been enumerated by various gentlemen, in their inaugural addresses, so well, that it is not necessary for me to recapitulate them, as I presume you all read the JOURNAL, and have had impressed upon you the importance of acquiring these qualifications, so far as it lies in your power to do so. I would just add that it is only those men who have learned trades near akin to the general duties required of a gas manager that should get encouragement to take charge of works, or men of other trades who have given great attention in order to thoroughly learn the requirements, and are prepared to give their undivided attention to their duties, and not dabble with several different businesses.

The papers that have been read at last British Association meeting are, as usual, very interesting and instructive, particularly that of Mr. Hunt, of Birmingham, on "Washers or Scrubbers." There is one item of information furnished at that meeting, which demands your serious consideration. I refer to the advantage gained by Mr. Barratt, of Grantham, by working a scrubber. He stated that he had made a profit of something like £250 a year from it by ammoniacal liquor alone, and that, too, on the small make of 30 million cubic feet per annum. I may here mention that, some years ago, being at a gas-works on the Continent where two (of Messrs. Walker's) scrubbers were erected and in action, I had a conversation with the assistant engineer, who stated that he had made a calculation of the saving by substituting scrubbers for the three washers used continuously (so much on the Continent), and that it amounted to about £5000 per annum. The result was that some 20 works followed suit, swept their washers away, and substituted Mann and Walker's scrubbers. Of course, with cannels you could not expect such a gain, in consequence of so much less nitrogen. The paper by Mr. West, on "Mechanical Stoking," accompanied by photograph of machinery, to those of you having works large enough, may be very interesting, and will be found on the table before you. The paper on "Retort Settings," by Mr. Richards, of London, and the very elaborate and comprehensive paper by Mr. Warner, of South Shields, on "Various Methods of Jointing Mains and Laying and Connecting Services," as well as that by Mr. Peebles, of Edinburgh, at the North British Association, on "Gas Governors," are all very interesting, the two latter especially, with a view to the reduction of "unaccounted-for gas," to which I shall refer again.

The Sunday labour question has also, I am glad to see, again had its usual prominence. As Mr. Stewart said, this is a consumers question; and it will suffice here if I express the hope and belief that there is not a member of this Association who does not avoid Sunday labour as much as possible, and who, reading of others experience, will be enabled to do so still more. Like many other subjects, the unity of associations on the point is strength, and it is to the interest of managers themselves to put a stop to it as much as possible.

I am sure we are all glad to see the British Association take up the question of the establishment of a Benevolent Fund. All honour to those who have most exerted themselves, prominent amongst them being the Editor of the JOURNAL OF GAS LIGHTING, and one fellow-manager, Mr. Warner, of South Shields, both of whom deserve our warmest thanks—the first for his "Christmas Appeal" for assistance to the widow and fatherless, the second for his earnest endeavour to have the fund established. Let us hope they may not have so many occasions to render assistance, and the expressions of gratitude we receive, or any more "Christmas Appeals," and not be able to reply to them, but be able to do it with pleasure.

I will not detain you with further remarks on papers read at the British Association, but will refer to the inaugural addresses of the presidents of "British" and "North British" Associations. Those gentlemen have so fully dealt with the question of legislation affecting gas companies and gas supply, and to new inventions and discoveries, and have done it so much more ably than I can do, that I shall refrain from saying anything further here upon these subjects. But I would particularly draw your serious attention to the very able address of the president of the "North British Association," as by a careful perusal of it you will find that most subjects in general are referred to that more immediately concern ourselves in Scotland. I cannot, however, altogether agree with him (and I am sure he will excuse me for expressing my dissent) on one or two points. I invite discussion, particularly on the "desirability of trying to get 20-candle gas adopted as the standard illuminating power for Scotland." I notice a growing feeling among gas managers to this end, and several authorities I find have been, and are, referring to it. The Editor of the JOURNAL OF GAS LIGHTING occasionally reminds us that it is only by the united action of associations such as this the thin end of the edge can be got to work. The reference to upright retorts by the president of the North British Association demands our closer attention. The subject of not encouraging extreme reductions of price, for reasons he mentions, and the best means of extending information to consumers, to enable them more thoroughly to economize the gas supplied, and to get the best value for the smallest amount paid for gas, are interesting questions for our consideration. A few specimens of pamphlets circulated in various places, and the information given, I have brought with me; they are before you, and at our next meeting I think some one should bring up an elaborate paper on the subject. I shall be glad to lend all the information I can. Mr. Mitchell (Dundee) mentioned at the Edinburgh meeting that he finds most value from gas at three-tenths pressure, which is a new view of the subject. The card of information to consumers at Dundee, as issued by Mr. M'Crae, contains the same recommendation. I fear, in practical use, this low pressure is questionable.

The desirability of using self-acting dips, and so removing the back pressure on the retorts, has had some further elucidation, and the discussion on the subject at Edinburgh (see JOURNAL, Aug. 15, pp. 243, 244) takes in all views of the question. The pulsation referred to by Mr. Boyd seems to me the real cause of the deposition of carbon, so that the use of self-acting dips is useless, as the back pressure of the gas passing through other apparatus is still on the retorts, and either with or without dip, to my mind, certain pulsation will take place, either with or without exhauster. I should like to hear the opinion of those having self-acting dips, as to whether they notice any pulsation on the gauge attached to the hydraulic main. It seems, by the testimony of several gentlemen, that there is less pulsation with self-acting dips, and, consequently, less accumulation of carbon. My experience is that, with a 1-inch dip, no exhauster, and keeping tar out of the bottom of the hydraulic, the carbon does accumulate to a certain extent, and that even with inferior heats; and I attribute the cause to the slight pulsation. At our last meeting, Mr. Martin revived the subject, and his experience is the same, inasmuch as he had 10 inches pressure, with tar in the main, and all the troubles of carbon deposit. With the ammoniacal liquor, only 4 inches pressure on the ascension-pipe and retort, and, consequently, so much less pulsation, there was no carbon deposit worth mentioning. Where exhausters are used, and gauge on the hydraulic main, working at level pressure, and with ½-inch dips, carbon deposit is scarcely known.

I have seen every self-acting dip that has appeared, and never have been convinced of their practical value; but this pulsation question really points to there being an advantage in working them, and it is worth discussion further. I repeat my inquiry of those using self-acting dips, if they find there is any pulsation when the dip is not in action, and what is the net gain in working them? Mr. Nelson brought forward, at the Edinburgh meeting also, one of Copp's Patent Anti-Dips. I am glad to see he has kindly brought it here too. I would like some detailed information as to how Mr. Copp proves that 500 to 1000 cubic feet increase (of equal illuminating power, I mean) is gained by working self-acting dips, or anti-dips, and whether it is fact or supposition. It seems to me that the carbon, formerly accumulating in the retort, being prevented by the anti-dip, will increase the quality of the gas; but has the exact increase been properly defined?

Mr. Young's paper on the "Utilization of the Gases Resulting from the Destructive Distillation of Shale in the Manufacture of Paraffin Oil," concluded the reading of papers at Edinburgh. It is full of interest to most of us, and may lead us into paths and thoughts that will bear practical fruit, after many days, to our advantage.

I have now to refer to "leakage" or "unaccounted-for gas," and I regret that our "Statistical Report," so very creditable in many respects, and so highly spoken of by many at home and abroad, shows that there is room for improvement in this respect, as in many instances the unaccounted-for gas is over 10 per cent. This should not be, unless from extraordinary causes, for which, of course, all allowance must be made. We should look well to our meters, especially dry meters. One of the causes of the failure of dry meters is, that the diaphragms are tied with cord, which if put on slightly damp probably dries afterwards, and so becomes leaky and allows the passage of gas without registering. They should be tied with fine wire, which can be drawn tighter than cord, and is not liable to get loose after. I had a 10-light meter some time ago, which had been at work only a few years, the leather of the diaphragms of which was lying in the bottom of the meter, when taken to pieces for repair. This meter had been fixed at a consumer's where the consumption was very regular, and when compared to the former registration, and by a wet meter fixed for a time after, it was found to have been going 20, 30, and so on gradually to 90 per cent. slow, at which point the frost stopped the registration altogether, but not the gas passing through it. A number of other dry meters were entirely worthless after working a year or two, and meter makers refusing to have anything to do with them, the construction being so bad. Wet meters, too, are very imperfect, in practice, though considered of good make, and there is no doubt much need frequently to overhaul and test some of them. I am aware of the infallibity of dry meters as specially enumerated by some makers, and of the very elaborate paper by Mr. Douglas, of Portsea, some time ago; but I find them very fallible in all for which they are upheld to be perfect. The valves, especially in meters of smaller sizes, stick if they come to stand two or three months. Several friends of mine agree with me, that Mr. Douglas's experience is not borne out in our practice. My advice, in buying meters, is, buy the best, for though they are the dearest at first, depend upon it they are the cheapest in the long run. I will not enumerate other causes by which unaccounted-for gas is increased, as they have been so ably set forth several times. It is, however, my opinion, that there is not one-half the difference that is supposed, between the measurement at the station-meter and consumers meters, if the works are properly constructed and the temperature of gas at the inlet of the station-meter is kept below 60° Fahr., as it should be; neither do I believe there is more than 2 per cent. lost by exosmose with 12 to 18 candle gas, or 1 per cent. with 22 to 34 candle gas, if it is that much. The 5 per cent. theory of loss by exosmose is all "bosh" in my opinion; most of the loss that is attributed to exosmose is most likely going through service-pipes in various ways; for instance, stealing, leakage, 2-light size meters passing gas to 6 to 12 lights, and in such proportions, and consequently so much slow. I hope few of you have had the experience of myself, to find next door perhaps a 3-light or 5-light one to 1-light; but many managers will bear me out that, having done away with such inconsistencies, and having put on meters of sufficient capacity to properly measure and pass the quantity required through them, their return of unaccounted-for gas has greatly diminished, and the balance of profit greatly increased.

Again. I would ask, what right have the shareholders of a gas company, or the committee of corporation gas-works, to sanction that public lamps shall be lighted free, and so make the gas-consuming public pay entirely for public lighting, which should also be paid for equally by the non-gas consuming ratepayer; or, in other words, taxing the gas consumer for the benefit of the ratepayer who does not use gas? It is about as sensible as the Corporation of Arbroath, some time ago, putting on a rate of 6d. per pound to make up a deficiency in the gas accounts, and so taxing the non-gas consuming ratepayer for the benefit of the gas consumer. Take one instance mentioned in our "Statistical Report," of which there are several—"lamps lighted free." At Hamilton, there are about 300 lamps, equal to 5d. per 1000 in the price of gas. In the next district, "Bothwell," there is something similar. See the disadvantage to managers, when prices are compared with other towns, without this lamp question being mentioned. You will agree with me, that very much of unaccounted-for gas is going through public lamps. When I came into charge of my present works, it was the case—equal to about £60 per annum on 130 lamps at the price of 8s. 4d. per 1000; at 5s., as now, it would, of course, be much less. There were also old worn-out and leaky stopcocks, not turning the gas fully off from one month's end to another, and some so loose as to be leaking two or three feet per hour, the pressure at the point of consumption being much more at many lamps than what it was at meter-lamps. I tried them with a pressure-gauge, and found them as follows:—

No. 1 meter-lamp,		17-10ths	pressure at burner.
No. 2	,,	18-10ths	,, ,,
No. 3	,,	19-10ths	,, ,,
Various lamps near		No. 1 meter	24-10ths pressure.
,,	,,	No. 2 ,,	24-10ths ,,
,,	,,	No. 3 ,,	29-10ths ,,

Taking an approximate calculation by testings of burners at such pressures with the test gasholder (a national standard one), and number of hours burned in eight months of lighting season, and number of lamps and loss by unmetered lamps, I estimated the total quantity unaccounted-for at about 144,000 cubic feet. I immediately requested to have regulators put on, sent for samples, and explained them, but was told by the authority who had the public lighting in charge, "they were nae better than an ordinary burner, he would have no change, and that expense was out of the question." Having enlarged the inlet

and outlet to the meters, and substituted wet for dry meters, so as to bring the pressure as nearly as possible to that of the surrounding lamps, and adopted double burners (made by Milne) similar to some on the table before you, and which are the same principle as the Brönner burner, I found a great improvement, and less waste of gas.

From the remedies I have enumerated, and some extraordinary and other general causes, so well known to us all, being removed, I have succeeded in reducing my unaccounted-for gas from 30 to 10 per cent.; but as we have extraordinary disadvantages to work against, I cannot expect to reduce it further until all is reconstructed in first-rate order. I might add, these disadvantages are caused by low salaries, ignorance, and director-managers management, and Jacks-of-all-trades for meter inspectors, working for low pay, and running through their work in as short a time as possible, taking as many meters as 40 on guess, not registering, no cleaning or watering, some not at all for two years, others 10,000 too much on parties who could ill bear mistakes, and others charging 10,000 too little, and writing "meter standing," and charging at a guess, because they could not read the index; such are few instances of a dozen different meter inspectors on a survey or district in nine years. And what was the result? After some years of directors management, gas paid for per ton of best second-class cannel 6000 cubic feet. And works and plant generally relapsing into a most dilapidated condition, no reserve-fund, and very little dividend.

Again. I was explaining to a director of a neighbouring gas company the advantages of a governor, when he exclaimed, "Oh! No need for that; I am the 'governor.'" So much, then, for director-managers, who think they can make gas managers in a fortnight. Gas managers cannot, I think, fail to see they are always learning, and could do a great deal more in the interest of both consumer and shareholder, if better paid, and not so much physical work required of them. I refer to managers of works under 15 million per annum.

If a proper record is kept at the station-meter—a self-regulating overflow to same—proper supervision over distributing and measuring arrangements, the returns of unaccounted-for gas above 10 per cent. would soon disappear.

The finish of the president's address, and the report of the subsequent proceedings at the meeting, will be proceeded with in next number.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly Ordinary Meeting of Shareholders was held on the 16th inst.—Mr. F. T. Mappin in the chair.

The directors report and statements of account, as follows, were taken as read:—

The profits for the half year ending the 30th of June last are £25,658 15s. 6½d., and will leave, after paying the maximum dividend, a balance of £3504 10s. 2d. to carry to the credit of the reserve-fund.

The figures will be—

Dividend on £135,000 class A stock, after the rate of £10 per cent. per annum	£6,750 0 0
Dividend on £209,053 10s. class B stock, after the rate of £10 per cent. per annum	10,452 13 6
Dividend on £99,700 class C stock, after the rate of 7½ per cent. per annum	3,738 15 0
Dividend on 12,937 new ordinary £10 shares (£3 per share paid up, but of which £1 was only paid on the 31st of March last), being after the rate of 7½ per cent. per annum, or 1s. 10½d. per share	1,212 16 10½
Surplus to carry to reserve-fund	3,504 10 2
Total	£25,658 15 6½

After adding the above surplus, the reserve-fund will stand at £44,329 1s. 3d.

These figures your board consider fully justify the reduction they made of the company's maximum charge, after the 30th of June last, to 3s. per 1000 cubic feet. So long as such maximum charge shall remain at or under that rate, it is (under the company's special Acts) in the power of the shareholders to vote to the elected directors for their services any sum they may think fit, not exceeding £900 per annum.

Mr. John Younge, the company's engineer, in April last tendered his resignation, which your directors accepted, and Mr. William Romans (who for several years was the engineer of the Alliance Gas Company, at Dublin) has since been appointed engineer to the company.

Shortly after the last general meeting, Mr. Henry Unwin ceased to hold the amount of stock or shares requisite to qualify an elected director, and the vacancy thus caused in the board was filled up by the appointment of Mr. James William Harrison.

Your directors regret that soon afterwards another vacancy occurred in the board, by the decease of Mr. Charles Hoole, who, for upwards of seventeen continuous years, had ably and assiduously acted as one of the company's elected directors. That vacancy was supplied by the appointment of Mr. Horace Walker, as an elected director of the company.

Messrs. Hudson, Hobson, and Harrison, three of the elected directors, retire by rotation at the present meeting, but are eligible, and offer themselves for re-election.

Dr. *Capital Account, for the Half Year ending June 30, 1876.* *Cr.*

Class A stock, fully paid up	£135,000 0 0	Land, buildings, parliamentary, and other expenses, works, and machinery (including mains to June 30, 1855)	£410,660 2 10
Ditto B do. do.	209,053 10 0	Mains from June 30, 1855	67,320 4 9
Ditto C do. do.	99,700 0 0	Meters	28,991 0 2
12,937 new ordinary £10 shares (2nd issue), £3 per share paid up	38,811 0 0	Balance	14,993 2 3
Amount raised on mortgage	39,400 0 0		
	£521,964 10 0		£521,964 10 0

Dr. *Revenue Account, June 30, 1876.* *Cr.*

Half year's gas and meter rents, due this day	£62,819 10 5	Half year's expenditure in the production of gas	£57,819 17 11
Amount arising from the sale of coke, tar, waste lime, and ammonia water	17,207 9 9	Paid mortgagees & bankers for interest during the half year	768 10 10
Amount realized from the manufacture of sulphate of ammonia, sale of gas-fittings, and work done (after deducting all charges) and house and other rents	4,220 4 1½	Balance	25,658 15 6½
	£84,247 4 3½		£84,247 4 3½
Balance brought down	£25,658 15 6½	Dividends payable Nov. 1, 1876	£22,154 5 4½
		Balance to be carried to reserve-fund, Nov. 1, 1876	3,504 10 2
			£25,658 15 6½

Maximum price of gas, 3s. 1d. per 1000 feet to June 30, 1876, when it was reduced to 3s. per 1000 feet.

General Balance, June 30, 1876.

Balance of revenue account	£25,658 15 6½	Ledger balances, and accounts owing to the company	£36,056 18 7½
Ledger balances, and accounts owing by the company	39,951 13 3	Stores in hand	14,765 4 6
Balance of capital account	14,993 2 3	Balance due from bankers	29,779 11 6
		Balance due from cashier	1 16 11
	£80,603 11 0½		£80,603 11 0½
Reserve-fund, invested Dec. 31, 1875			£39,167 4 11
Amount transferred on revenue, May 1, 1876			814 2 7
			£39,981 7 6
Interest to June 30, 1876			843 3 7
			£40,824 11 1

The Chairman moved the adoption of the report, and in doing so said he had to congratulate the shareholders upon the success which had attended the operations of the company during the half year. The directors had not spent a large sum on the capital account, but they had spent all that they considered it was necessary to spend. The amount thus expended was £5249, making the total capital expended up to the end of June last £506,971. The profit made during the half year ending in June, was £25,658 15s. 6d.; and out of this, after paying 10 per cent. on the A and B shares, and 7½ per cent. upon the C and new £10 shares, a balance would remain of £3504 10s. 2d. to carry to the reserve-fund. That fund would then stand at £44,329 1s. 3d., an amount which the directors had every reason to believe was ample to meet any future requirements of the undertaking. The result of the last half year's working had justified the directors in making the reduction in the price of gas which they notified would take place on the 1st of July. The particulars of the revenue account were somewhat as follows:—They had expended more during the past half year under 14 different heads by a sum amounting to £4659 18s. 1d., and they had expended less by £4901 13s. 7d. The largest and most important item under this decreased expenditure was that relating to coals, which had cost £4130 5s. 5d. less than during the corresponding half of 1875. On the opposite side of the account, they had received more for residuals, gas, the profits of the chemical works, and from other sources, to the extent of £4836 5s. 4d., of which £2854 16s. 1d. more was received for gas than during the corresponding half of last year. On the other hand, they received something less for coke, rents, gas-fitting department, and some other items, by £2178 17s. 8d. No doubt the present was a favourable time for gas companies. The price at which the directors were enabled to purchase coals must result in a profit to the company, and anticipating this, they made the reduction in the price of gas which he had just alluded to. Mr. John Younge, the company's engineer, had recently resigned, and in his place the directors had appointed Mr. William Romans, a gentleman in whom they had every confidence, and they hoped they would have cause to be fully satisfied with his knowledge, industry, and attention to his duties. Two vacancies had been created on the board—one by the death of Mr. C. Hoole, and the other in consequence of Mr. Unwin having lost his qualification by disposing of his shares. The vacancies thus created had been filled by the appointment of Mr. J. W. Harrison and Mr. Horace Walker. In looking over some matters relating to gas-works, he had been much struck with the prospects of the Manchester Corporation, who possessed the gas-works in that city. The works were purchased by the corporation many years ago, and considerable sums had been apparently realized from them. The corporation were now called upon to enlarge them to an extent never before known, and what was intended to be done was the most important step yet taken in the gas world. The Manchester Corporation had asked engineers to furnish designs for the construction of entirely new gas-works of very large capacity, and had offered a premium of £500 for the first selected, and smaller premiums for the second and third. The premium for the first design had been obtained by Messrs. Mangnall and Littlewood, of Manchester, who estimated the cost of buildings, retorts, and machinery at £750,000. This was independent of land, sidings, and other appliances connected with railways. The second design was that of Messrs. G. W. Stevenson and Paull, whose estimate was £618,000; and the third was that of Messrs. Newton, Chambers, and Co., the estimated cost of which was £830,000. This certainly was an enormous outlay for any corporation to be suddenly called upon to make; and he did not think it was a wise and proper policy for the Manchester Corporation to pursue, to tax the gas consumers to the extent they were, at the same time freeing large ratepayers who might not use gas to the same extent that others did. The present price of gas in Manchester was 3s. 6d. per 1000 cubic feet. In conclusion, he assured the shareholders that the works of their company had been carried on to the best of the directors ability; not, however, at times, without much trouble and anxiety, and occasional disappointments. But he could say that they were in all respects well managed, and that the results were equal to the desires and expectations of all concerned.

Mr. J. Crookes seconded the motion for the adoption of the report.

Mr. F. C. Smith, while admitting that the business of the company generally had been admirably managed, yet complained that delays took place in the registration of transfers of stock.

The Chairman promised that he would do his best to prevent any unnecessary delay in future.

The report and accounts were unanimously adopted.

On the motion of the Chairman, seconded by Mr. John Wilson, dividends at the rate of 10 per cent. on the A and B. shares, and 7½ per cent. on the C and new £10 shares were declared. The dividends to be payable on the 1st of November.

Mr. Watson moved a resolution to the effect that form the 30th of June, and until further order, the remuneration of the elected directors be after the rate of £900 per annum, so long as the maximum charge for gas shall not exceed 3s. per 1000 cubic feet. He considered the sum mentioned in the resolution was but a small acknowledgment of the able and valuable services of the directors in bringing the company into such an enviable position as that which they now occupied. It was almost entirely due to their energy, perseverance, and foresight, that the shareholders were receiving such dividends as had just been declared, and that the reserve-fund had reached upwards of £40,000, a sum abundantly sufficient to meet all possible and improbable contingencies. Alluding to what the chairman had said about the Manchester Corporation spending from £500,000 to £800,000 upon new gas-works, he asked whether the mention of this by the chairman was the foreshadowing of something similar that might take place in connexion with their company. It was rather impertinent to ask such a question; but was there any prospect of their having to spend such an amount? If more capital was to be called up, he imagined they would all be glad when the day arrived. He expressed his surprise that so large a saving as £4000 had been effected in coal during the past half year, as his impression was that the coalmasters were still putting it on pretty strongly. Such a saving, he imagined, was due to the directors having made most favourable contracts.

Mr. W. Chapman seconded the resolution.

The Chairman, in reply to Mr. Watson, said he did not think they were at all likely to spend any large additional amount of money upon their works. They had expended upon capital account what they considered necessary, but it was not much. The shareholders had not had many heavy calls made upon them, and they would doubtless remember that the last call was only £1 per share. He might tell them now that he believed they could have done without that call; but it was not necessary that he should go into any explanations about it. They wanted money at the time, but, from circumstances which had since arisen, he believed their funds were ample. There was, therefore, no prospect of any further call. In answer to Mr. John Wilson, he said that the directors of no company of which he had had experience attended to their duties so regularly as the directors of that company.

Mr. T. Roberts, manager, stated that the £900 mentioned in the resolution was an increase of £150 a year, and the continuance of the increase depended upon the price of gas remaining as low as it now was.

The motion was carried unanimously, and

The Chairman, in acknowledging it, said he considered the clause in the Act, which enabled the company to increase the remuneration of the directors when the price charged for gas did not exceed 3s. per 1000 cubic feet, was a most satisfactory one. Whether the increased remuneration had anything to do with their management he could not say; but the company were in a position to supply gas at that price.

A vote of thanks to the chairman and directors concluded the proceedings.

NATIONAL ASSOCIATION FOR THE PROMOTION OF SOCIAL SCIENCE.

Health Section.

At the opening of this Section on Monday, Oct. 16—Mr. Thomas Hawksley, C.E., the President, delivered the following address:—

To have been requested to preside on this occasion over an important section of a congress of eminent persons, all earnestly and usefully occupying themselves with studies, investigations, and discussions, having for their object the improvement of the physical, social, and moral condition of the human race, has been to me a matter of the most pleasurable surprise. The position with which you have thus honoured me is also all the more gratifying, inasmuch as your present meeting is being held in one of the greatest commercial cities of the world, a city existing under conditions almost, if not entirely, peculiar to itself, and, consequently, presenting to the thoughtful sociologist many subjects worthy of his special consideration.

I shall place before you some of the experiences and conclusions of a man of 70 years, who for the last half century has been occupied in professional avocations, the performance of which has necessarily brought him into frequent communication with the working classes of this kingdom, and has, consequently, afforded him a not inconsiderable insight into their daily lives and habits, and has also enabled him to become somewhat intimately acquainted with their modes of thought, their wants, their expectations, and their aspirations.

The working men and their belongings constitute by very far the largest element of the vast population of this country. It is their interest in the important questions I propose to discuss in this address with which I shall chiefly concern myself; and with this object I shall confine my remarks, for the most part, to matters of a practical character bearing upon the topic of "Health," to which the attention of this section of the Association is more especially directed. Nevertheless, I shall be under the occasional necessity of offering for your consideration some remarks on the cognate subjects of political economy, legislative intervention, and Governmental action, so far, and so far only, as, in my opinion, they stand directly related to the leading features of my discourse.

For obvious reasons, I shall also confine my remarks to matters affecting the people of England and Wales, which, for brevity's sake, I shall hereafter designate by the word *England* only, and this the rather because each of the sister kingdoms of Scotland and Ireland has her own special sanitary legislation and her own special local government.

The population of England now amounts to 24 million persons, distributed over about 30 million acres of cultivable land. There is, therefore, one person to an acre and a quarter, whereas in most (and averagely in all) of the other kingdoms of Europe, there are about five acres of land to each person; and on the entire surface of the earth (exclusive of the arctic zones) about ten acres of land to each person; or, after a fair deduction for uninhabitable deserts and mountains, probably seven or eight acres of cultivable land to each person. This statement sufficiently indicates the extraordinary density (as it is rather oddly termed) of our English people.

But this is not all, for the absolute increase in the numbers of our population is something enormous; and, looking to the means of living, and the preservation of life and health, this enormous something must become a matter of the greatest and, as I think, most immediate concern and anxiety, alike to the statesman, the legislator, the economist, and the sanitarian. Naturally, the annual ratio of increase, as determined from the excess of births over deaths, is, on a mean of many years, almost exactly that of 10,150 to 10,000; or, in other words, 10,000 people living at the commencement of a year are augmented to 10,150 at its termination. Now, taking our present population at 24 millions, and assuming this ratio of 10,150 to 10,000, and, to simplify the illustration, taking the duration of a current generation at 42 (accurately 41·8) years, as is found by the Registrar-General from his last published Life Tables, the following results may follow:—

At the end of the first generation the population of England might become	44,808,000
At the end of the second generation	83,656,000
At the end of the third generation	156,000,000
At the end of the fourth generation	291,000,000
At the end of the fifth generation	544,000,000

And so on, till, in the seventh generation, the people of England and English descent, even if not then all in England, would exceed in number the present population of the whole world; and in 20 generations (little more than the time which has elapsed between the Norman Conquest, when England first became possessed of a rude but stable government, and to-day) would amount to $24{,}000{,}000 \times (1{\cdot}015)^{20} = 27{,}220{,}000{,}000$, and would require 20 worlds as populous as our earth now is, for their habitation. We shall see by-and-by how very importantly these otherwise apparently frivolous calculations bear upon the subject before us.

But, again, it is said that England is relieved of its superfluous population by emigration to other lands. To a small extent this is true. But I must, before proceeding to measure its effect, beg you to keep in mind the fact that calculation has already shown the impossibility of finding room, either at home or elsewhere, for the teeming millions our country produces. Nor is it any answer for an enlightened statesmen to say, "Oh! but something providential will surely happen;" or, "Sufficient for the day is the evil thereof." Yes, something will happen; and I venture, without presumption, to tell you from this place, that the evil is even now upon us. Let us, however, resume our calculations, taking into account the actual effect of emigration upon the ratio of increase. In the year 1801, at a time when the power and counsels of England could make themselves influential in continental affairs, the population was only 8,892,356, while in 1871 it had become no less than 22,712,266, thus exhibiting a mean annual increase of nearly 1·35 per cent.; in other word, 10,000 people living at the commencement of a year became, at its termination, 10,135. We are thus enabled to establish that the annual loss by war and emigration only amounted, over these 70 years, to the difference between 10,150 and 10,135, or 15 persons in every 10,000 of the population. Assuming, however, that this amount of, mainly spontaneous, loss will remain unaltered over a prolonged course of years, how then stands the question we have at this moment under our consideration? Surely thus:—

At the end of the first generation the population of England will become	42,000,000
At the end of the second generation.	74,000,000
At the end of the third generation	130,000,000
At the end of the fourth generation	230,000,000
At the end of the fifth generation	400,000,000

At the end of the seventh generation more than the world now contains, and at the end of the twentieth generation more than 15 such worlds would contain, each as densely populated as our globe is at present.

Now, what are the inferences to be drawn from these calculations, apart from other momentous facts which I am about to lay before you? It is very obvious that the later events which the calculations tell us might arise, if they could arise, will never occur, because of their essential impossibility. But what is it that will prevent their occurrence? The world is old, older than any of us can surmise, and it is not filled with people yet. Why is this? Because it has sad stories to tell of famine, war, poverty, destitution, and pestilence; of mouths to be filled, and of an insufficiency of food to be put into them; of diseases to be cured, which the art of the physician has been unable to arrest in their fatal career; of popular discontent, which no government has been able to allay. A sadder picture of a possible future could not be drawn from the evidence of the past. It has, indeed, been charmingly said that that man is a benefactor to the country, who can make two blades of corn grow where only one had grown heretofore. But, what if the want of two—and that is our present want—becomes the want of four, and eventually the want of ten or twenty blades? Where, then, will our hypothetical benefactor be found?

You are all aware, as familiar facts, that England is already a large importer of food, and that the industrial classes, forming the great bulk of the people of this country, are the chief consumers of these commodities. It may also have occurred to you, that upon the sufficiency and steadiness of these supplies, the comfort and health of these classes are, to a great extent, dependent. I have, however, found that very few of my intimate friends—many of them not only eminent sanitarians, but also well read on subjects of political economy—have so much as suspected the great deficiency of our own resources. Happily for us, during the "piping times of peace," and the prevalence of a "roaring trade," at home and abroad (induced in no small proportion by our own demands for foreign assistance), we have been saved from the contemplation of the misery, sickness, and mortality, which inevitably follow in the wake of poverty and famine, however quietly and heroically these may be, for a time, sustained. I am old enough to have seen, and have a vivid remembrance of such painful scenes in our own country; and few of you will have forgotten the extraordinary calamity which befell Ireland, and how little could be done to avert the evils attendant upon it, or even to mitigate the more serious of their effects.

The Customs returns enable us to estimate that about 40 per cent. of the most important articles of the food of the people now comes from abroad, and this, too, for the daily sustentation of the existing population of 24 millions, a per centage which, year by year, will be sensibly added to as the population of our country continues to augment. We look at our Board of Trade and at our Customs returns—we rejoice because we find so many millions of exports, and so many other millions of imports, and we exclaim, with vast exultation, "*Eheu!* was there ever so great a nation as the English?" But we are utterly oblivious of the all-important fact that our exports consist of commodities we cannot eat; whilst our imports consist largely of commodities without which we should surely sicken and starve. Now I ask you, as earnest sociologists, whether a nation can, in the proper sense of the word, truly say of itself, "I am great," so long as it is unable, if need be, to maintain itself? I look, indeed, with alarm to the signs of the times, the general restlessness of European nations, and the possibility of our being entangled in a war—perhaps a war of creeds, ultimately to extend itself to a war of aggrandisement and conquest—for, without in the least doubting the prowess of England, and her ultimate ability to come with glory from the fray, I cannot avoid expressing the apprehension that our supplies of food from abroad may be for a time very seriously interfered with, if not wholly interrupted. With the instance before him of the doings of the *Alabama*—a vessel of war hastily built on the opposite shore of the Mersey—let every patriotic sociologist beseech the Government to look well to its navy, with the object of maintaining our old command of the sea, and for ensuring the protection of that mercantile marine, without the aid of which there can be neither health nor happiness for the multiplying millions of this country.

But the practical sociologist must extend his views beyond the necessities of the hour. The number and consequent density of our population is, year by year, becoming greater, and year by year each individual of us, intentionally or unintentionally, becomes more earnestly engaged in the disagreeable endeavour to elbow his neighbour out of his way. We rejoice—fatuously, I would say—and sing pæans in praise of the increasing strength and prosperity of the nation—the strength of a noble structure firmly based upon a visible rock, beneath which a mine has been cunningly laid—when to explode heaven only knows. Would that the warnings of the much-belied Malthus—a far-sighted man of this county—were again listened to and regarded. Would that our Government would exercise itself in that political prevision which looks rather to prevention than cure; for I am well assured that the now-existing waywardness of our working population, its spirit for menacing combinations and trade-unionism, its misguided endeavours to compel the employment of three men to do two men's work, its ignorant belief that increased wages necessarily imply an increased purchasing power, its utter forgetfulness that, as working men are customers one of another, they must eventually lose on the one hand as much as they gain on the other, besides placing themselves and their country in an unfavourable position with other nations trading or competing with us, and also its blind adherence to arbitrary rules and regulations as harassing to the immediate employer as they are annoying to the general public—all have their origin in the apprehension (unfounded though it may be thought to be) that we stand too closely upon the ground to make free and independent action perfectly safe each to each. In my opinion, then, our cry ought to be for "space—more space;" and, looking to the enormous extent of our colonial possessions, it appears to me that a most important opportunity now presents itself, warranting our Government in affording facilities—I do not say inducements—to enable the surplus working man to better his condition, if he so desires, in other suitable climes.

It is essential to the proper understanding of this momentous subject, to bear in mind that the augmentation of the population to its present numerical strength has been rapid even to suddenness; and whilst perfectly natural under the exceptional conditions which have produced it, is nevertheless abnormal when viewed from a standpoint which commands a vista of ages and the history of mankind from an earlier period.

We have good reason to believe that when "Domesday Book" was written, the population of England was between four and five millions. In the reign of the eighth Henry it did not much, if at all, exceed five millions, for the wars and pestilences of the middle ages had effectually checked that very small ratio of growth which is the common incident of nations solely occupied with agricultural pursuits; whilst in the early years of the reign of George III. it is certain that the entire population did not number more than 7½ millions. But then a change in the life of the people suddenly took place. Watt invented his steam-engine; Arkwright and Crompton invented their spinning-machines. Our wealth of minerals was sought for and found; our manufacturing ability became developed. The wars of the French Revolution and the Great Napoleon occurred. We assumed the control of the sea, and we swept the ships of other nations from its surface. Our commercial supremacy was established, and remained until the second rupture with America, an uncontested fact. Indeed, for nearly half a century we monopolized the manufactures and commerce of the world. Notwithstanding our lavish expenditure on wars and on armaments, and on subsidies, the people became from year to year richer, and as the means of living increased, so did the numbers of the population increase. There is evidence, however, that after the termination of the Napoleonic wars this exceptional condition of things was fast coming to an end. Bad, though well-intended, legislation with respect to the importation of food brought the people to the verge of starvation, for, even at that period of our recent history, we had ceased to be able to provision the ten or eleven millions to which the population had then increased.

But again fortune favoured us. We invented the power-loom, and further improved our spinning machinery; and coals being plentiful, those machines became driven by steam with marvellous rapidity, and because no other nation was, at that time, prepared to follow in our wake, we became the clothiers of the world. Then followed the railways, themselves only the *sequelæ* of the steam-engine, Neilson's invention of the hot-blast, and the general application

of steam to the purposes of navigation; and, finally, a hasty and in some respects injudicious repeal of the Corn Laws, instead of their proper modification. By this time the population had become sixteen millions; but wealth rolled in; and food, by the aid of our extended commerce, flowed in from every quarter of the globe. Our prosperity, except that of the agricultural interest, was almost unbounded. And then succeeded the gold discoveries which, for a time, stimulated our manufactures and commerce, and certainly saved our agriculturists from the ruin with which they were threatened, for, whilst all other trades commanded the markets of the world, the prices of the farmer were ruled from Poland, Odessa, and America.

Still we got on more than well, for foreign nations had not yet fully awakened to the necessity of providing for themselves, or of entering into competition with us. But then came the shock to our industries in the blind and foolish struggle between capital and labour, between the working man and his employer. Even yet we got on, not very well, indeed, but sufficiently so, for the Continent of Europe and the United States were still, fortunately for us, too fully occupied with actual and contemplated wars and political struggles to attend in an important degree to the full development of their own home resources. In the meantime, although in other branches of trade our progress was not so marked, we had succeeded in bringing our coal and iron trades, and most of the manufactures dependent upon them, to an unexampled state of exaltation. Money and food flowed in even in unwonted abundance, and we became a nation of 22 million people; we had trebled our numbers in a single century.

But soon all this was to undergo a change. A condition of affairs arose, the possibility of which no political economist had foreseen, and which political economists had deemed to be impossible. The labourer and capitalist-employer suddenly combined virtually to raise the prices of their commodities against the general public at home and abroad. This unnatural combination for a time succeeded. Everybody was made to pay for the article he wanted, much more than its proper price. The recipients rejoiced. The British public grumbled, and became more careful in their expenditure. The thoughts of other nations became turned in new directions, and they proceeded to make for themselves the articles they could no longer afford to purchase from us, or which, by means of new industries, they could obtain more cheaply, and perhaps of better quality (inasmuch as for many years we had been lowering our standard of quality), either at home or elsewhere than in England. We have thus damaged, I think, irretrievably our manufactures and commerce, and we have brought, or are bringing, ourselves to a condition which, in my judgment, must end in the impoverishment of the classes which, in their elation at a temporary success of their misconceived movement, have recklessly signed the warrant for the death of their own prosperity. America, Belgium, France, Russia, and Prussia, have all been driven to create extensive mining and manufacturing establishments, which, but for our own imprudence in the matters of price and quality, would not have been needed; and some of these establishments are actually supplying the English markets—and that, too, in considerable quantities—with classes of goods of which we have hitherto believed ourselves to be the assured monopolists. Notably I may mention that the finished iron of Belgium is now being supplied to most of the seats of our iron manufacture; and, by way of instance, that Lancashire fire-proof mills are, at the present time, being constructed with Belgian girders; whilst, as you probably know, spinning-mills of large capability have arisen in America, France, Russia, India, and other places, the productions of which are not generally inferior to those of our own country.

We have, at this moment, an increasing population and a declining trade. Will our statemen, preoccupied as they are with the struggles of parties, adopt timely measures to avert the otherwise inevitable consequences of our own imprudence, and take steps adequate to the purpose of keeping open the great highway of the ocean for the transmission of the food of, it may well be, unemployed and hungering millions?

(To be continued.)

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The trade of the town and district has not improved since the date of my last report, nor do I suppose that there will now be any real alteration until the political atmosphere is calmer. There were, of a certainty, numerous indications of a better state of things up to about a week ago, when the critical condition of Eastern affairs attracted universal notice, since which buyers of all kinds of articles have held back from making purchases. Unless some decisive step be taken at once, we may look for a very dull state of things in the iron trade during the whole of the winter, and a serious amount of distress amongst the families of the iron and steel workers. So far, however, pig iron is very steadily held at late rates, there being an expectation that if war should be declared certain branches of the local trades would at once become very active. In the armour-plate mills, even now, the plates are being rolled as fast as the dockyards and arsenals can deal with them. The North of England agents now quote the following prices:—No. 1 foundry pig, 50s.; No. 2 foundry, 48s. 6d.; No. 3 foundry, 47s.; No. 4 foundry, 45s.; No. 4 forge, grey, 44s. 6d.; No. 5 forge, mottled, 44s.; No. 6 forge, white, 42s. 6d.; refined metal, 65s.; Kentledge, 5s. 6d.; and cinder pig, 39s., all cash.

There has again been a steady demand for coal, mainly for household purposes, in consequence of which several of the local coalowners on Friday, the 20th inst., advanced their prices 6d. to 1s. per ton. For manufacturing fuel the inquiry rules quiet, owing to the depression in the iron and steel trades.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Both in the coal and iron tron trades of this district there is a less animated tone than was noticeable a week or so back. In the one case the mildness of the weather is keeping back consumers, whilst in the other, the advance in prices has apparently had a tendency to check farther transactions.

A very fair trade is, however, still being done in the better classes of round coal, and although there is some little competition for orders, prices are generally well maintained at late rates, the lowness of stocks naturally tending to keep the market firm, and colliery proprietors are merely waiting for the winter demand to set in before advancing their quotations. A small increase upon last month's quotations has already been obtained in some quarters upon Pemberton classes of fuel, which are not now quoted lower than 9s. per ton at the pit; but generally colliery proprietors have not been able to obtain better prices, and probably no alteration in current rates will be made during the remainder of the present month. Common classes of coal, except such descriptions as can be used for house-fire purposes, continue rather a drug in the market, owing to the depression in the iron trade, and in gas-making coals there is not much new business doing. There are a few inquiries still in the market; but the bulk of the buying has already been done, and prices remain without any material alteration, good screened Wigan four-feet at the pit mouth being still quoted at 8s. to 9s. per ton. Supplies of burgy and slack are now becoming rather plentiful in the market, and some pushing is necessary to effect sales. Prices consequently exhibit a slightly weaker tone, and 5s. 6d. to 6s. per ton for burgy, and 3s. 6d. to 4s. per ton for ordinary slack at the pit, are about the top quotations obtainable.

There is an unsettled feeling amongst the miners in several districts, and there is a probability of an agitation for an advance of wages being commenced before long. In the Oldham district, a strike is already threatened, unless the masters give back the reduction which was made a short time ago, and in the Ashton district the Bishop of Manchester has been asked to act as arbitrator in a dispute between the masters and the men.

There has been less buying in the iron trade during the past week, but prices generally are very firm; and Lancashire makers of pig iron, although they are securing very little new business, are not disposed to give way in the least, their quotations remaining stiff at late rates. In the finished iron trade, some of the forges are in a better position, but founders and engineers still complain of the badness of trade. For bars delivered into the Manchester district, the quotations range from £6 15s. to £7 per ton.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade of the Tyne kept remarkably brisk last week. Most of the leading gas-works have, of course, contracted for the season. But when best gas coals have to be purchased in the open market, the price paid for them is from 9s. to 10s. per ton, with turns from a fortnight to three weeks for shipment. Medium kinds are selling from 7s. to 8s. per ton. The very large quantity of 37,836 chaldrons of coals have been shipped at the Tyne Dock within six days, and the greater proportion of them have been gas coals of various kinds. Steam and coking coals are in pretty good demand for the season.

Both steamers and small vessels were very well employed last week in carrying household coals from the North of England to London, the east coast, and the British Channel. The reduction made by the umpire (Dr. Playfair, M.P.) of 7 per cent. upon the wages of the Northumberland pitmen will not affect prices one way or the other.

There was a considerable increase in the quantity of coasting business done in the market last week. Merchants were a trifle urgent for handy little ships to load coals, and about 3d. per ton more money had to be paid upon freight. The freight for steamers to load coals to London will now closely approach 5s. 6d. per ton. The French and Irish business in gas coals is well sustained. There is a moderate trade doing with the Baltic, and a slight improvement in the value of outward business to the Mediterranean. The war panic has caused a great rise in the rate of freights for corn from all the Russian ports. They are about double what they were last year. A good deal of business is also being transacted in timber from the same quarter. In fact, the Russian merchants seem bent on realizing upon their produce as quickly as ever they can.

The iron trade of the North of England is no worse, certainly. The impression seems to be confirmed that prices will not get lower, and there is a stronger disposition to enter upon business. The war rumours of last week had the effect, however, of keeping foreign trade back. Prices in the chemical market fell on Thursday, when the war news was made known.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The illuminating quality of the gas supplied to Greenock during the month of September, as reported to the Police Board, was as follows:—Minimum, 27·03 standard candles; maximum, 30·35; average, 28·47 candles. These results were obtained at the testing-office, which is fully two miles from the gas-works. The average, as determined there, was 29·87 candles.

Dr. Wallace's report upon the Glasgow Corporation gas, for the week ending Oct. 14, states that the minimum illuminating power ranged from 26·59 candles to 27·40 candles, the average from 27·58 candles to 28·43 candles, and the maximum from 28·69 candles to 29·96 candles. In all cases the Tradeston station is credited with the highest results. In the Dalmarnock gas there were 11·31 grains of sulphur and ·21 grain of ammonia per 100 cubic feet.

At the last meeting of the Glasgow Police Board there were submitted the minutes of the Watching and Lighting Committee, of date Oct. 13, which stated that the committee had again under consideration the question of the best description of gas-burner to be used in lighting the city, and with a view to test satisfactorily the merits of Horton's burner, proposed to be adopted by the board, and that proposed by Mr. Foulis, along with his alteration of the regulators now in use, agreed to recommend that Nelson Street, Tradeston, and Renfrew Street, City, should be lighted with both sets of burners, distributed in such manner as to afford opportunities by inspection from time to time of judging of their comparative merits, and that the clerk be directed to intimate this to the Gas Commissioners.

In addressing his constituents, last Friday night, Mr. William Dron, engineer, another member of the Town Council of Glasgow, referred to the work of the Corporation Gas Committee, of which he is a member. He congratulated the ratepayers on the fact that during the past two years the deficit in the gas accounts had been wiped off, and that at the present moment there was a balance at the credit of the account of £28,000. The works, he was glad to say, were being conducted on the most economical principles, and probably by this time next year the price of gas would be reduced to 3s. 7d. per 1000 feet. So far as consumption was concerned, the works were very prosperous, 5½ per cent. more gas having been sold during last year than in the previous year, and if this increase continued, of which there was every probability, the whole of their plant at Dawsholm might be expected to be utilized, which was not the case at present. The total revenue from the gas-works last year was £364,895; but though the undertaking was thus prosperous, and there was a large surplus, he objected to the proposal that it should be applied to the reduction of debt on other municipal departments. He thought the ratepayers should have the advantage of the saving in the reduction of the price of their gas.

The subject last referred to by Councillor Dron was likewise under consideration in the First Ward, and it was moved, seconded, and unanimously resolved—"That the First Ward electors object to the repeated attempts made by members of the Town Council to hand over the surplus profits arising from the manufacture of gas to the corporation funds, and that in future their representatives be asked to oppose it on every occasion when it is brought up."

In consequence of the increased consumption of gas in Coatbridge and the neighbourhood, the directors of the gaslight company of that town—the Dudley of the Scotch "Black Country"—have resolved to make important extensions to their works. The present premises being quite inadequate for the production of the quantity of gas required in the district, the directors have secured a piece of ground of about 11 acres at Burnbank, on the Row Estate, to the north-east side of the town, at a cost of £3700. The ground is most suitably situated for the projected works, having rail communication direct off the North British Railway. Operations will shortly be commenced for the erection of two gasholders, each having a capacity of 240,000 cubic feet. Offers have been lodged for the supply of new mains—1020 yards 15 inches in diameter, and 520 yards 12 inches in diameter—which will convey the gas to the centre of the town, where the consumption is heaviest. Within the last six years the consumption has been very great. The quantity sold in the year 1870 was little over 16 million cubic feet, whereas the make last year amounted to nearly 35 million cubic feet. The extensions are to be conducted under the superintendence of the company's manager, Mr. Robert Mitchell.

An explosion of gas took place on Friday evening in a tailor's workshop at Troon. The gas had been escaping under the flooring, and when a board was lifted, and a light applied, an explosion occurred, which was so powerful as to

blow out the front of the building, and shatter the roof. The owner and other occupants of the place were injured.

Mr. William Millar, one of the town councillors of Glasgow, told his constituents last week that the income of the Glasgow Water Commissioners last year was £131,000, and the expenditure was £106,000, leaving a surplus of £24,000. There had been added £80,000 to capital. The sinking-fund now was £110,489. When the new pipe was laid there would be 50 millions of gallons per day. The consumption last year was, from Loch Katrine, 29,068,451 gallons, and from Gorbals, 3,951,409. This showed a decrease in the consumption, because in the former year the amount was 34,537,000 gallons. Yet Glasgow was consuming more water than any city in the kingdom. If the inhabitants were more careful, and saw that their water-fittings were tight, there would be a much smaller consumption than now. He mentioned that in a district of the city the officials had warned the people that if their fittings were not right, the water would be cut off. The result was that there was a large decrease in the consumption. There had been spent in 21 years £1,400,000. The money was all done, and as they had to go on with certain new works, as well as with the river pumping works, they were going to promote a small bill for the purpose of increasing their borrowing powers to the extent of £450,000. Thereafter they would require no more money for many years, if ever they required more.

The Cupar Water-Works are now in such a forward state that they may be opened at the end of the present week. It is probable that the Works Committee will decide on having a formal opening in about a fortnight.

A few days ago the superintendent of the Greenock Water-Works reported that there was water in the reservoir capable of providing 103 days supply for all purposes, against 80 at the same time last year. The consumption amounted to 57 gallons per head per day, on a population of 68,000.

During last quarter the inspector of the Aberdeen Water-Works found in the city 37 water-cisterns, 82 water-closets, and 262 water-taps leaky, but these have all since been repaired.

There was a fall of about 9d. per ton in the price of pig iron last Wednesday morning, but the decline was nearly all recovered by the end of the week, when the market closed, buyers, 56s. 6d. cash, and 56s. 7½d. one month; sellers 1½d. per ton more. Several makers have reduced their prices 1s. per ton.

Some varieties of coal are in better demand, and prices are somewhat firmer.

East London Water-Works Company.—This company have given notice of their intention to bring under a constant supply of water a further large area in the Bethnal Green District in March next.

Glasgow Water Supply.—The Loch Katrine water supplied to Glasgow during last month is reported by Dr. Mills, of the Andersonian University, to have been nearly colourless, but to have contained suspended vegetable fibres.

Drainage of Kingston.—Proceedings against the Corporation.—On Thursday last the summonses taken out against the Corporation of Kingston and the Surbiton Commissioners, at the instance of the Thames Conservators, to recover penalties for not preventing the sewage of their respective districts from flowing into the river, came on for hearing. After some discussion, Mr. Clark, who appeared for the Corporation, stated that since May last a plan for the disposal of the sewage had been under consideration, and suggested that the case should stand over for six months, by which time it was hoped something effectual might be done. Mr. Pugh, on behalf of the Surbiton Commissioners, stated that his clients were in treaty for an estate on which to deal with their sewage, and he also asked for an adjournment. The bench decided to allow both summonses to stand over for six months, to enable the authorities to prepare a satisfactory scheme.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

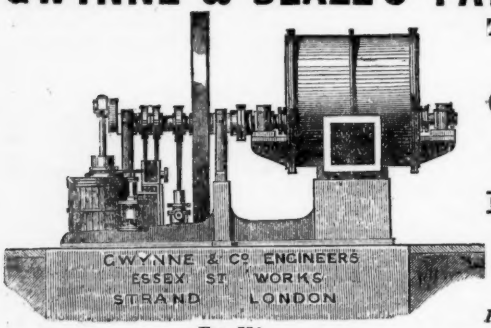


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

GWYNNE & CO.

HAVE MADE THE

LARGEST AND MOST PERFECT

EXHAUSTING MACHINERY

Ever produced, and the most economical in working.

Prices and every information on application.

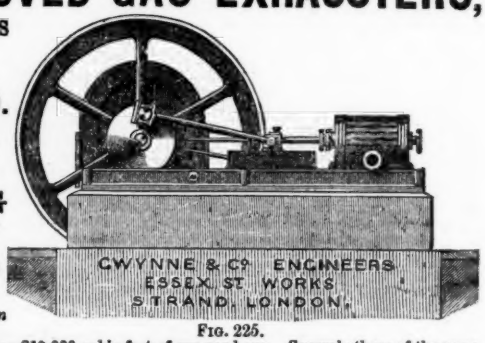
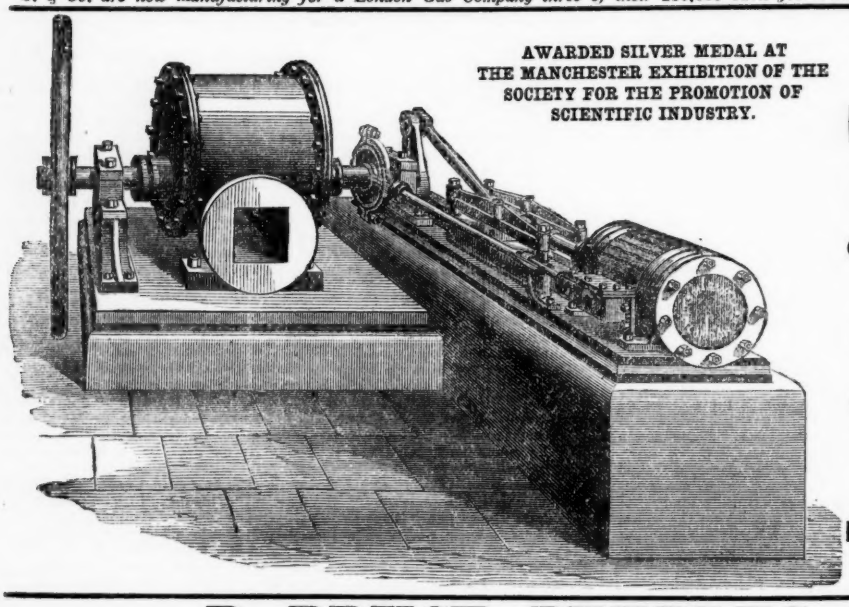


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 800 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO
GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*



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BEALE'S

Improved Patent

GAS-EXHAUSTERS

WITH

ENGINES COMBINED.

Sole Makers,

GEORGE WALLER & CO.

Makers of
ENGINES, EXHAUSTERS,
INDEX and DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, and other PUMPS,
SCRUBBERS and PURIFIERS,
CONDENSERS, BOILERS, &c.

PHŒNIX ENGINEERING WORKS,
HOLLAND STREET, S.E.,
AND
STROUD, GLOUCESTERSHIRE.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS;

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S.E., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

GAS-WORKS CLAUSES AMENDMENT ACT, 1871.

ANNUAL ACCOUNTS OF GAS COMPANIES.

FORMS OF ANNUAL ACCOUNTS, arranged as required by the 35th Section of the Act (34 & 35 Vict., cap. 41), are now ready.

These Forms have been printed on large sheets of paper of the best quality, and are carefully ruled so as to afford the utmost facility for compliance with the provisions of the Act.

Price 3s. 6d. per dozen, free by post, or may be ordered of any Bookseller.

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A Specimen Sheet on receipt of Six postage stamps.

ADVANTAGES OF GAS FOR

COOKING AND HEATING.

HINTS ON GAS BURNERS, &c.

By MAGNUS OHREN, A.I.C.E., F.C.S.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works, Lower Svdenham, London, S.E.

WANTED, for the Whitstable Gas-Works, a good STOKER. None need apply who cannot have a good personal character.
Apply to the MANAGER, Gas-Works, Whitstable, KENT.

WANTED, a Stoker, steady and industrious. Constant employment. Wages 24s. 6d. per week. Overtime paid. A good character indispensable.
Address No. 316, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED immediately, two good STOKERS. Wages 4s. 3d. per day. Those used to an exhauster preferred. Constant employment.
Apply, with testimonials or references, to GEO. SMEDLEY, Manager, Gas-Works, Buxton, DERBYSHIRE.

WANTED, two good Stokers for a small country Gas-Works. Wages 26s. per week. Stop working twelve hours on Sundays.
Address No. 321, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a second-hand (from 500 to 600 light) STATION-METER, to pass from 3000 to 3600 feet of gas per hour. To be in thoroughly good working order.
Apply, stating particulars, to THOMAS HICKS, Secretary, Burnham Gas Company, Limited, Burnham, SOMERSET.

WANTED, a Man, competent to repair and test gas-meters, to act as FOREMAN in the Meter Department.
Apply to Mr. JOHN HUTCHINSON, Manager, Gas-Works, Barnsley, stating age, salary expected, and previous experience.

WANTED, on the 30th of October, a STOKER, for a Gas-Work near London. Constant employment to a steady, industrious, young married man.
Apply, by letter only, on or before Oct. 27, stating wages required, to P. SEAMAN, Manager, New Romney Gas-Works, KENT.

WANTED, for about three months, a competent person to undertake the TESTING of GAS-MAINS in a small provincial town.
Applications, with testimonials of competency in similar engagement, stating wages expected, to No. 313, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANAGER (working) Wanted imme- diately, for the New Romney Gas-Works. Must thoroughly understand the manufacture and distribution of gas.
Apply, stating terms, to GILBERT ALLEN, New Romney, near Folkestone, KENT.

THE Advertiser, a practical, mechanical, and Gas Engineer, wishes for a SITUATION in a Gas-Works or a Gas and Water-Works, at home or abroad. Knows the best system of retort-setting and making sulphate of ammonia, and is well up in the different branches of out and in door and office work. Highest references and testimonials.
Address No. 320, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAWINGS and Specifications for Gas-Works: Ironwork by a Gas Engineer, Buildings by an Architect. Terms moderate. Open also to treat for Leasing Gas-Works.
Address No. 319, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TWELVE Gasholder Columns for Sale, cheap and good, about 30 ft. high by 2 ft. diameter at base, 1 ft. 6 in. at cap. Moulded caps and bases, guide-rails, and brackets complete. Suitable for gasholder 80 ft. to 100 ft. diameter.
Apply to Mr. JAMES HALL, Manager, Gas-Works, St. Helen's, LANCASHIRE.

TAR

THE Undersigned are open to Purchase TAR in large or small quantities,
Address HAMILTON, MACBEAN, AND CO., Tar Distillers, Black Horse Bridge, Deptford, LONDON.

THE Swansea Gaslight Company have for immediate SALE, the following Plant:—
A 6-h.p. Patent Trunk Engine. (Beale.)
Cylindrical Egg-ended Boiler, 20 ft. by 4 ft. 6 in. (Beale.)
Exhauster to pass 15,000 feet per hour. (Beale.)
An 8-h.p. Grasshopper Engine. (Easton and Amos.)
Cylindrical Egg-ended Boiler, 20 ft. by 4 ft. 6 in. (Easton and Amos.)
Exhauster, 20,000 ft. per hour. (Beale.)
Tar, Liquor, and Water Pumps, Eccentrics, Shafting, and Driving Pulleys.
Wrought-iron Condenser, six vertical Legs, 30 ft. high, 24 in. by 6 in., with tar-boxes, dips, and syphons.
Wrought-iron Scrubber, 5 ft. diameter, 20 ft. high.
Cast-iron Scrubber, 3 ft. diameter, 20 ft. high.
A set of four cast-iron Purifiers, 12 ft. square by 5 ft. deep, with galvanized wrought-iron covers, lifting apparatus, four tiers of wooden sieves, 10-in. connexions and valves.
May be seen at the Gas-Works, Swansea. The whole in perfect working order; replaced by plant of larger dimensions.
Further particulars may be obtained on application to Mr. THORNTON ANDREWS, Swansea.

BELFAST CORPORATION GAS-WORKS.

THE Gas Committee of the Belfast Cor- poration are prepared to receive TENDERS for the AMMONIACAL LIQUOR produced at their works, for such a term as may be agreed on, say Three, Five, or Seven years, from the 1st of July, 1877.
The quantity at present made is about 800,000 gallons per annum, and a considerable increase may be expected.
Sealed tenders, endorsed "Ammoniacal Liquor," and addressed to JAMES GUTHRIE, Esq., Town-Clerk, will be received up to Jan. 1, 1877, and all information may be obtained on application to JAMES STELFOX, Manager.

TO GASHOLDER MAKERS AND OTHERS.

THE Directors of the Altrincham Gas Company are prepared to receive TENDERS for the erection and construction of a Single-Lift GASHOLDER, 130 ft. diameter, at Hale Moss.
Plans and specification to be seen at the Company's Offices, Moss Lane, Altrincham, on and after Wednesday, the 25th inst.
Tenders to be addressed to the Chairman of the Gas Company, not later than the 15th of November.
The Directors do not bind themselves to accept the lowest or any tender.

BY ORDER.

Altrincham, Oct. 20, 1876.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

COAL TAR.

THE Directors are prepared to receive TENDERS for the surplus TAR produced at the works of the Association, at Vienna, Austria, during Two or Three years, commencing the 1st of May next, the quantity being about one million gallons yearly. Payments to be made monthly. Contractors will be required to find security for the performance of their contract.
The Directors do not bind themselves to accept the highest or any tender.
Offices, 30, Clement's Lane, Lombard Street, London, to which all replies are to be addressed.

By order,
ALBERT F. JACKSON, Secretary.

Oct. 19, 1876.

TO CHEMICAL MANUFACTURERS, TAR DISTILLERS, AND OTHERS.

TENDER FOR TAR AND LIQUOR.

THE Directors of the Gravesend and Milton Gaslight Company are prepared to receive TENDERS for the purchase of their surplus TAR and AMMONIACAL LIQUOR for One year, from the 13th of November next.
The quantity of Tar will be about 40,000 gallons, and that of Liquor about 65,000 gallons in the year.
The Company will load into the Contractor's barges. The average strength of the Liquor is about 11 ounces, but the Company will not guarantee that or any other strength.
Any further particulars can be obtained on application at the works, at Gravesend.
Tenders, marked "Tender for Tar, &c.," to be sent to my Office, 27, King Street, Gravesend, on or before Wednesday, the 1st of November next.
The Company do not bind themselves to accept the highest or any tender.

TUFNELL SOUTHGATE, Secretary.

Gravesend.

Now ready, price 7s., by Post 7s. 3d.,
A SECOND EDITION (fcap. 8vo., morocco gilt)
OF

THE GAS MANAGER'S HANDBOOK,

CONSISTING OF

Tables, Rules, and Useful Information for Gas Engineers, Managers,

And others engaged in the Manufacture and Distribution of COAL GAS.

BY THOMAS NEWBIGGING, A.I.C.E.

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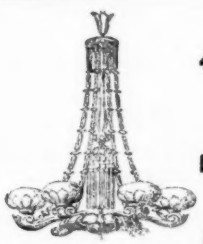
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.



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ESTABLISHED 1807.

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HAVING A VERY LARGE STOCK OF

Sluice Valves and Hydrants

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Prices and Particulars on Application.

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AND
CONSULTING GAS ENGINEER,
BROOKLYN, CHEETHAM HILL ROAD,
MANCHESTER.

Mr. ALFRED LASS.
30, GRACECHURCH STREET, LONDON, E.C.,
Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

JAMES WHITFIELD,
CLARINGTON BROOK FORGE AND IRON FOUNDRY,
WIGAN, LANCASHIRE.
CAST & WROUGHT IRON WORK,
ALSO
FIRST QUALITY RETORT AND OTHER SHOVELS FOR GAS-WORKS.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Reguiating the Pressures in the higher levels of a district.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

THE Vale of Neath Dinas Fire-Brick and Cement Company, Limited, Pontwalby Works, Glyn Neath, South Wales. Manufacturers of the Celebrated Genuine Dinas Fire-Bricks and Cement for Siemens's Regenerative Gas Furnaces, Bessemer Converters, Copper Smelting, Roofs of Puddling Furnaces, Glass-Works, Gas-Works, Coke Ovens, and processes involving intense and long-continued heat. Prices and estimates on application.
London Agency, 11, Queen Victoria Street, City.

GARSIDE'S IMPROVED MAIN DRILLING CLIP.
No. 1 takes from 2-in. to 6-in. Mains.
No. 2 takes from 6-in. to 12-in. Mains.
GARSIDE'S REGISTERED TUBE-VICE takes ⅝ brass to a 2-in. Socket.
May be had direct from the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET, DURHAM.
Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers and Steam Joints.
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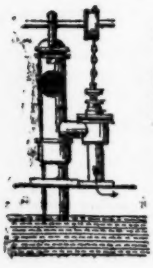

Produces from 10 to 20 per cent. more gas of higher illuminating power.
Prevents the deposit of carbon.
Retorts last much longer.
Charges work off quicker.
This simple invention has been in use in many works for the last six months, with the above results.
PRICE 2 GUINEAS EACH.
Testimonials and particulars on application.
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Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
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STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES,
CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

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ATLAS METER-WORKS, OLDHAM,
MANUFACTURERS OF
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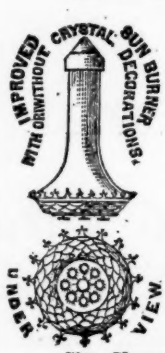
And every Description of Gas Apparatus.

B. GIBBONS, JUN.,
DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,
STOURBRIDGE (Established 1834),
MANUFACTURER OF EVERY DESCRIPTION OF
Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts,
A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

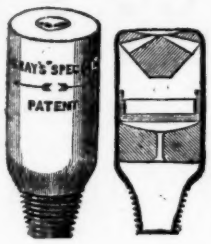
Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
	18 in. × 15 in.,	20 in. × 16 in.,	22 in. × 14 in.,	24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.

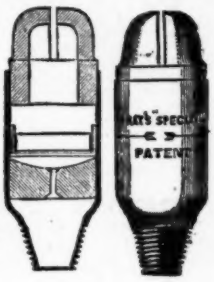
TO GAS COMPANIES AND THE TRADE.
J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.



GAS MOONS,
Cut and Engraved, of the newest designs
GAS REFLECTORS
In Silver and Glass
GAS NIBS
AND
BURNERS
Of every description.
Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1876, are now complete.
City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.



BRAY'S NEW GAS-BURNERS.



BRAY'S "SPECIAL"
TRADE MARK.
PATENT.

A NEW FEATURE IN GAS LIGHTING.

OUR WELL-KNOWN

PATENT "ENAMEL" REGULATOR GAS-BURNERS

(UNION JETS AND BAT'S-WINGS)

Were designed as improvements on the common Burners, and that object has been so successfully attained that they have, we believe, met with more approval and recommendation from the Gas Engineering Profession and the Public than have been accorded to any other firm's make of Burners since the commencement of gas lighting.

Of the two kinds of Burners—the Union Jet and Bat's-wing—in general use, the latter is the least useful, because of its want of adaptability to general circumstances, and great liability to get out of order; but, when in good order, it has hitherto had the advantage of yielding more light with common and medium qualities of gas than the Union Jet. The Union Jet, on the other hand, has the advantage of greater adaptability, being useful everywhere, is less liable to get out of order, requires scarcely any attention, and will stand more rough usage. Notwithstanding these great practical advantages, which are almost everything in a Gas-Burner, Gas-Burner improvers have been attracted to the Bat's-wing, because of its giving a more showy result when tested for illuminating power only.

We have succeeded in improving both Bat's-wing and Union Jet Burners; but, while adding materially to the efficiency of the first-named, it is specially noteworthy that the Union Jet has received most advancement by these improvements. While retaining all the advantages of the Union Jet, we have brought it up in ILLUMINATING POWER to the level of the most expensive Bat's-wings specially got up for developing that feature. The result is such that we have no hesitation in pronouncing BRAY'S "SPECIAL" UNION JET

THE BEST BURNER HITHERTO PRODUCED,

AND

A NEW FEATURE IN GAS LIGHTING.

The leading features of this NEW UNION JET may be summarized as follows:—

It gives more light, from the smallest to the largest sizes, than any Union Jet was ever before known to give.

It gives 30 to 60 per cent. more light than the common Union Jets.

It gives as much light as the most expensive Bat's-wings specially constructed for high illuminating power, without the Bat's-wing's disadvantages.

Tested on the Photometer at various consumptions—say, 3, 4, and 5 feet of Gas per Hour, or any similar variation—and the results averaged, our New Burner will show a higher illuminating power than the best Argand. If the tests are made downwards and upwards as well as laterally, the results will be still more in favour of our New Burner.

ADDITIONAL ADVANTAGES possessed by our NEW BURNER over all others in the market, and these are applicable and are added to our IMPROVED BAT'S-WING:—

In all Burners having an arrangement for diminishing the flow of Gas before it arrives at the point of ignition, that part of the Burner which effects this object has been a source of weakness, because of its being placed in a position very liable to fracture, and easily tampered with. Indeed, this is so arranged that any one can get at and break or widen out the inlet for the Gas at pleasure, and make what ought to be an economical Burner a most extravagant one. In our New Burner, this part is so hard that it cannot be enlarged by drilling, and is so arranged that it cannot be otherwise tampered with without breaking up the whole Burner; this forming, we believe, the most efficient safeguard yet introduced against the extravagant use of Gas by those who have not to pay for it.

The Gas Supply being given through one ROUND hole, which is made through non-corrosive material, it is not so liable to stop up or get out of order as in cases where a number of small holes or narrow slits are used. When these holes are made through *metal*, the lasting property of the Burner so constructed is almost *nil*, even if the aperture is not tampered with.

There is no hissing noise caused by the passage of Gas through the diminishing arrangement of this Burner.

☞ All our "Special" Burners have our Trade Mark stamped on the sockets thus BRAY'S "SPECIAL" PATENT.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

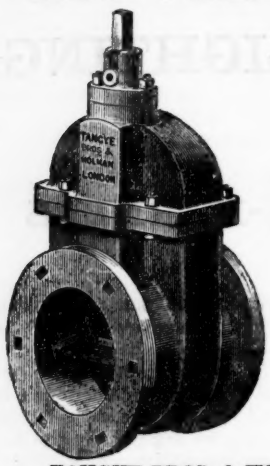
BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conducters, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

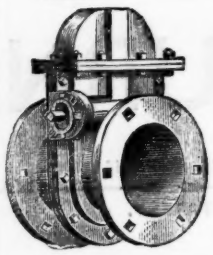
IMPROVED
GAS-VALVES.



SIZES AND REDUCED PRICES ON APPLICATION.

TANGYE BROS. & HOLMAN,
LAURENCE POUNTNEY LANE,
LONDON.

B. DONKIN & CO.'S
IMPROVED GAS-VALVES



WITH WROUGHT-IRON PINIONS,

List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.

VALVES MADE WITH OUTSIDE RACKS TO ORDER.
ALSO, SCREW WATER-VALVES WITH GUN-METAL FACES.
ALSO SOLE MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS.

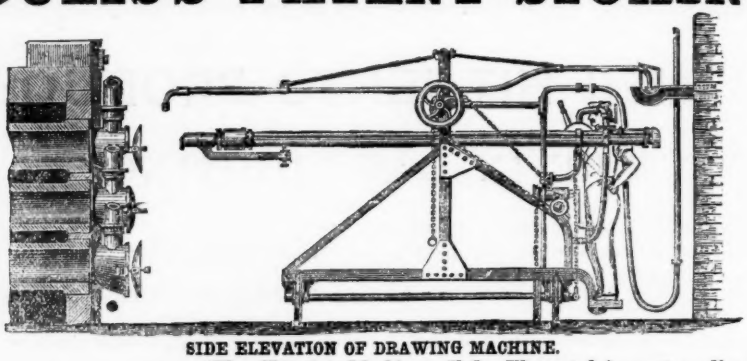
B. DONKIN & CO.,
GENERAL ENGINEERS AND IRONFOUNDERS,
MAKERS OF STEAM-ENGINES,
55a, BLUE ANCHOR ROAD, BERMONDSEY,
LONDON, S.E.

J. T. B. PORTER & CO.,
GAS ENGINEERS & MANUFACTURERS,
IRONFOUNDERS AND CONTRACTORS,
GOWTS BRIDGE WORKS,
LINCOLN.

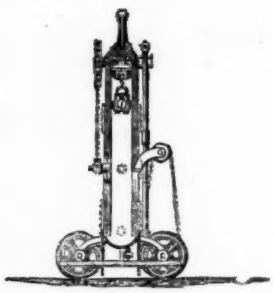
ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—It is most particularly requested that all Communications be addressed to the FIRM ONLY, as circumstances have arisen which render this necessary.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz:
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

ALDER AND MACKAY,
GRANGE WORKS, EDINBURGH,
MANUFACTURERS OF
CONSUMERS IMPROVED GAS-METERS;
IMPROVED DRY GAS-METERS, in Cast-Iron and Tin Cases,
OF THE HIGHEST EXCELLENCE,
Warranted to measure correctly, and not to vary.

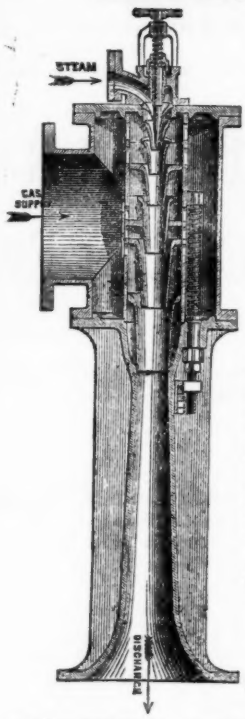
STATION METERS AND GOVERNORS,
EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

KÖRTING BROS.,

Steam-Jet Engineers,

7 and 17, LANCASTER AVENUE, MANCHESTER.

Germany: Cellerstr. 35, Hannover. Austria: Kolring., Pestalozzigasse 6, Vienna.
France: 11, Rue Louis-le-Grand, Paris. U. S.: 1645, N. 10th St., Philadelphia.



E. KÖRTING'S PATENT

STEAM-JET GAS-EXHAUSTER.

IMPROVED CLELAND'S PATENT.

Small Cost—Compactness—Perfectly Self-Acting—
Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—
No Extra Room Required—No Wear and Tear—No Noise—
No Oscillation in Vacuum, or Back Pressure.

UPWARDS OF 200 IN USE.

SUPPLIED TO—

Chartered Gas Co.	Glasgow Corporation.	Hanna, Donald, and Wilson, London.
London Gas Co.	Leyland Gas Co.	Ratcliff Gas-Works.
S. Metropolitan Gas Co.	Stalybridge Gas-Works.	Kendal Gas-Works.
Phœnix Gas Co.	Lincoln Gas-Works.	Longton Gas Co.
Liverpool Gas Co.	Birmingham Gas-Works.	Dartford Gas Co.
Bolton Corporation.	Wakefield Gas-Works.	Exeter Gas Co.
Horsham Gas Co.	Brentford Gas-Works.	Harrogate Gas Co.
Epsom and Ewell Gas Co.	Burnley Gas-Works.	Hertford Gas Co.
Ipswich Gas Co.	Guildford Gas-Works.	Waterside Gas-Works, Todmorden.
Cheltenham Gas Co.	Gloucester Gas-Works.	F. W. Grafton and Co., Accrington.
Sandwich Gas Co.	Kirkintilloch Gas-Wks.	
Cornholme Dis. Gas-Wks.	Nantwich Gas-Works.	
Bury Gas-Works.	Enniskillen Gas-Works.	

&c., &c., &c.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

SOLE LICENSEES FOR

W. CLELAND'S PATENT STEAM SCRUBBER,

Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

FOR PARTICULARS, APPLY TO

KÖRTING BROS., 7 and 17, Lancaster Avenue, MANCHESTER,

OR TO

GERALD J. TUPP, 8, John Street, Adelphi, W.C., LONDON,

SOLE AGENT FOR ENGLAND AND WALES.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 8000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

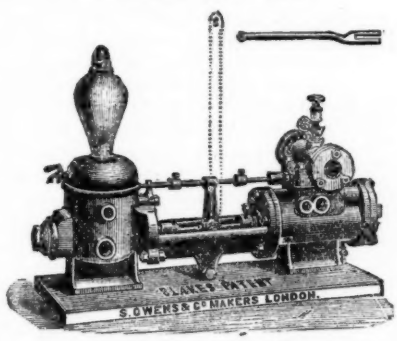
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

PLUTONIC CEMENT,

For Repairing Gas-Retorts in Action, preventing Porosity, and reducing the Deposit of Carbon, is highly commended.

WILLIAM RICHARDSON,

GAS AND HYDRAULIC ENGINEER,
CHARLES HENRY STREET AND BISSELL STREET,
BIRMINGHAM.

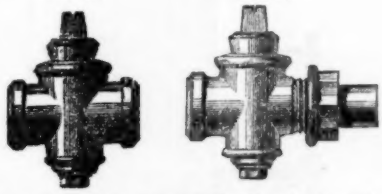
LAMBERT'S

CAST-IRON GAS-MAIN COCKS,

WITH PATENT WHITE METAL PLUGS.

TRADE (L) MARK.

No. 758. No. 759.



The bodies of these Taps are made of iron, black or galvanized, and the plugs of patent metal. They are warranted not to set fast or corrode, as do Iron or Brass Cocks; will always work easily; are strong, well made, durable; of little or no intrinsic value, and therefore not likely to be stolen; and the prices as stated below are (especially upon the larger sizes) fully 50 per cent. less than Brass Cocks.

	½	¾	1	1¼	1½	2-inch.
No. 758, with inside screws for iron pipe, black	2/0	3/0	4/4	6/6	7/6	12/0 each.
No. 759, with union on one end screwed inside for iron pipe, black	2/9	3/10	5/4	8/0	9/0	15/6 each.
Nos. 758 and 759, galvanized	0/3	0/4	0/6	0/8	0/10	1/4 extra.

MANUFACTORY:

SHORT STREET, LAMBETH, LONDON.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

(ESTABLISHED 1851.)

TRADE MARK

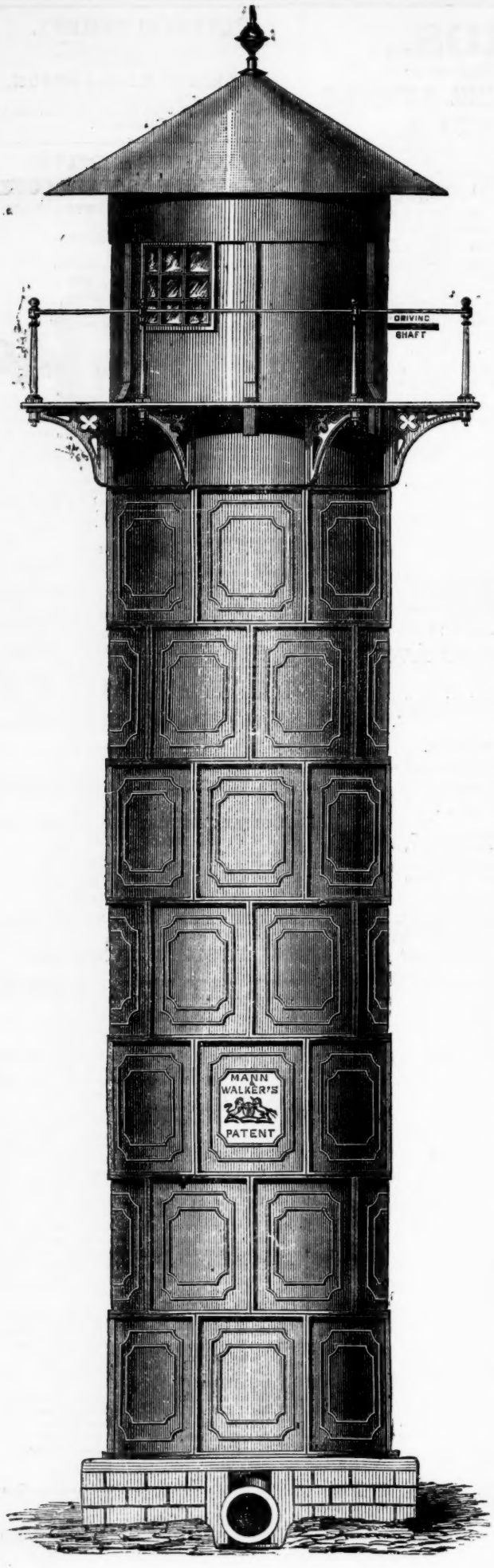
These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Waggon Works, and the Paint Trade generally. They are the BEST PROTECTORS of IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to ironwork. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only before use to be thinned down in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

PRICES and TESTIMONIALS on APPLICATION.



C. & W. WALKER,
8, Finsbury Circus,
London, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. and W. Walker, 8, Finsbury Circus, London, E.C., or to Mr. William Mann, late Superintendent of the Chartered Gas-Works, Blackfriars, London; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

J. EDMUNDSON & CO.,

19, GREAT GEORGE STREET, WESTMINSTER,
LONDON, S.W.,

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS.

CONTRACTORS FOR THE

ERECTION OF GAS-WORKS, GAS-FITTINGS, &c.,

FOR TOWNS, COUNTRY MANSIONS, &c.

Estimates given free of Charge.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

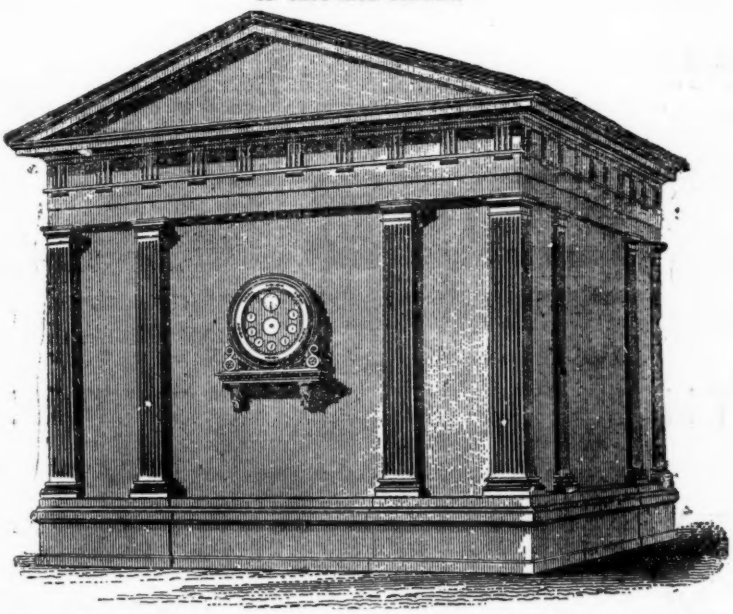
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES.

FUEL-MACHINE, for Compressing Breeze and Tar.

WASHERS, SCRUBBERS, and PURIFIERS, that Economize Space and Cost.

N.B.—Pamphlet, with Eighteen Illustrations of the foregoing, with letterpress on the construction of Gas-Works, post free, 2s. 6d.

SCOTTISH CANNEL COAL SUPPLY

AND

GAS ENGINEERING ESTABLISHMENT,

EDINBURGH.

In consequence of Mr. WILLIAM ROMANS having accepted the appointment of Engineer-in-Chief to the Sheffield Gas Company, the firm of J. and W. Romans, Gas Engineers and Coal Factors, is dissolved, and Mr. John Romans, C.E., F.G.S.E., is again Sole Proprietor.

Mr. Romans, in resuming the direction of this old-established business, desires to embrace the opportunity of inviting the attention of Corporations and Gas Companies to the great importance of a skilful selection of the Cannel and Coal to be carbonized. It is a fact known to those who have patiently manipulated the distillation of gas from Cannel and other Coals, with a view to obtain the highest economic results, that by a judicious intermixture of the lighter with the heavier gases, much of the rich hydrocarbons are saved, which otherwise would be lost during the process of manufacture.

It is with the experience of over 30 years continuous observation to this essential branch of science that Mr. Romans ventures to place at the disposal of his friends, Corporations, and Gas Companies at home and abroad, the practical knowledge he has thus acquired in the basis of gas manufacture and its residual products. Also upon all matters appertaining to the mechanical department of Gas-Works, he is, as a bred engineer, prepared to advise or contract for the supply or repair of the apparatus, or overlook and attest its construction for exportation.

OFFICES:

30, ST. ANDREW SQUARE, EDINBURGH.

N.B.—Mr. Romans has no INTEREST in, nor is he AGENT for, any special Colliery.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE &, BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

MOBBERLEY & PERRY,

FIRE CLAY and BRICK WORKS,

STOURBRIDGE.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAY.

Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE,

BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

B. CARPENTER,

(ESTABLISHED MORE THAN 16 YEARS,)

THE ORIGINAL MANUFACTURER OF

WOOD SIEVES

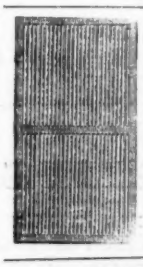
FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.



DEMPSTER'S

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 FEET WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS

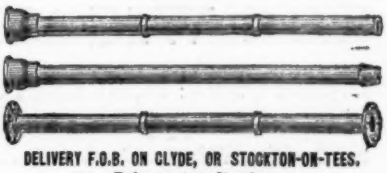
ELLAND, NEAR HALIFAX.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B. ON CLYDE, OR STOCKTON-ON-TEES.

Prices on application.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL
Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL
Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL
Yields 13,320 cubic feet of 32·5-candle gas per ton.
Prices and full Analyses on application.

CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
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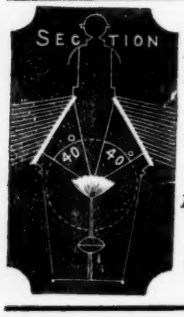

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Cubic feet of Gas yielded per ton . . .	10,050
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Yield of coke per ton of good quality . .	13¾ cwts.

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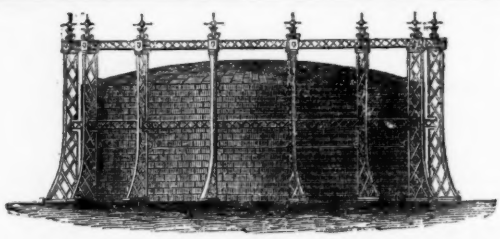

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Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.
N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

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JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

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Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

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MESSRS. NEWTON, CHAMBERS, & CO.,
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STRONGLY RECOMMEND A TRIAL OF THEIR

CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

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The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

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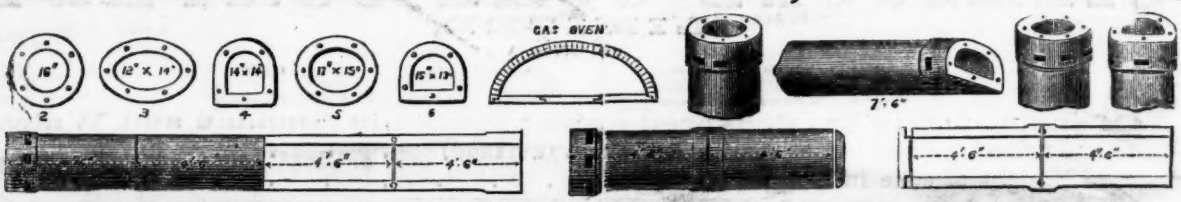

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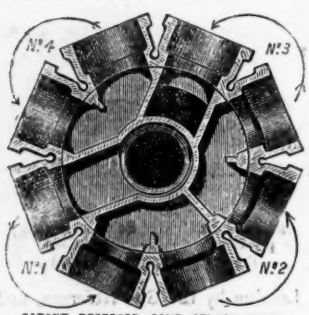

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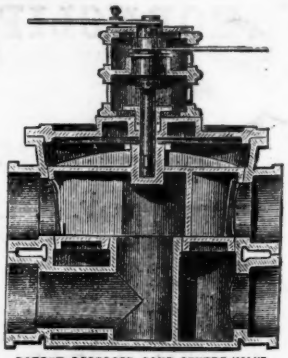
Of all descriptions.



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